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Digital Representation of Inuvialuit Traditional Knowledge: A case study in community engagement using Google Earth

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Abstract

Many Indigenous communities are mobilizing to document and share their traditional knowledge and cultural heritage. Information technology has created new opportunities for Indigenous communities, archaeologists, heritage groups, and technologists to collaborate on digital strategies to meet these objectives. Every Indigenous community has a unique history and world view, so the use of these digital approaches must be tailored to the needs of each case. The Inuvialuit are the Inuit of the Western Arctic, and their traditional knowledge is practiced through land-based activities such as hunting and fishing. The spatial nature of these activities has good potential to be represented in an interactive Google Earth map in a way that uniquely aligns with Inuvialuit epistemology and worldviews. This paper discusses the effectiveness, benefits, challenges, and implications of using Google Earth for the documentation and intergenerational sharing of Inuvialuit traditional knowledge and cultural heritage.

Summary for Lay Audience

The purpose of this research project was to gather input from the Inuvialuit community on how best to design an interactive Google Earth map that could be used to document and share Inuvialuit traditional knowledge and skills. Inuvialuit community members felt that a Google Earth map would be an excellent way to link photographs, videos, and stories about traditional activities to the actual places on the land where they occurred. Such a map such would closely resemble the mental maps that many Inuvialuit carry in their heads, which reflect their ways of knowing the world. A Google Earth map also appealed to Inuvialuit youth who saw its potential to help them to learn more about their cultural history and heritage. The interactive visual and auditory properties of Google Earth can mirror traditional approaches to Inuvialuit learning that emphasize listening and observation in addition to hands-on experience.

These research findings will be used by the Inuvialuit Living History project to construct a map that will be added to the Inuvialuit Living History Website (www.inuvialuitlivinghistory.ca) which will help to share this important cultural information with all Inuvialuit, and with other Canadians who want to learn about Inuvialuit history and traditions.

Keywords

Digital cartography

Indigenous traditional knowledge mapping

Community based archaeology

Landscape archaeology

Inuvialuit

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Chapter 1

1 An introduction to community based archaeology, Inuvialuit traditional knowledge, and interactive digital mapping

1.1 Introduction

Many Indigenous communities are mobilizing to document and share their traditional knowledge and cultural heritage. Archaeologists are seeking new ways to disseminate information about material cultural and the archaeological record. The pervasiveness of the internet, social media, and other mobile technologies have created new opportunities for Indigenous communities, archaeologists, heritage groups, and other technologists to collaborate on digital tools to achieve these outcomes. The digitization of traditional knowledge and cultural heritage can promote interactivity and provide greater access for Indigenous communities, but this strategy can also create new issues related to ownership and intellectual property rights associated with sensitive aspects of this information (Brown and Nicholas, 2012; Bollwerk, 2015; Boast & Enote, 2013; Dawson et al., 2011). At the same time, every Indigenous community has a unique history and worldview, and therefore the deployment of these tools must be tailored in contextually specific and culturally appropriate ways that align with the requirements of each community.

There are three culturally distinct groups of Indigenous peoples in Canada – First Nations, Metis, and Inuit. The Inuvialuit are the Inuit people of Canada's western Arctic. Their land claim area, the Inuvialuit Settlement Region (ISR) is located in the Yukon and Northwest Territories of Canada and spans over 1.1 million km². This land claim area was established in 1984 through the Inuvialuit Final Agreement (Government of Northwest Territories, n.d.). The six communities in the ISR are Inuvik, Aklavik, Paulatuk, Sachs Harbour, Tuktoyaktuk and Ulukhaktuk. The total population of the region

is 5,335 (Statistics Canada, 2016 Census of Population).

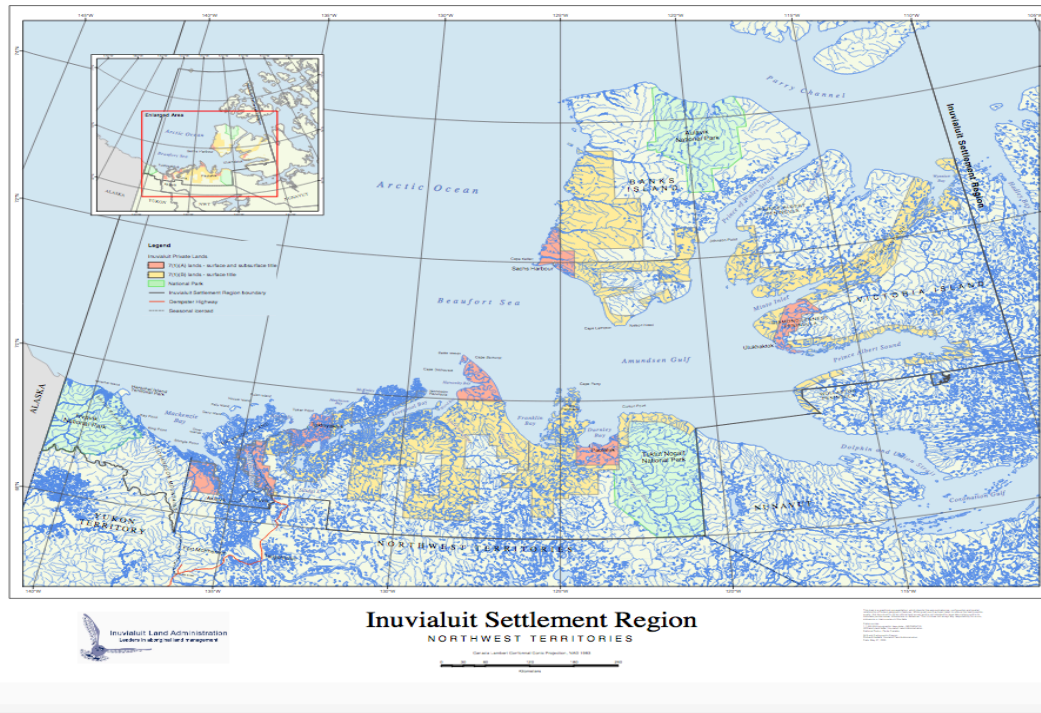


Figure 1: The Inuvialuit Settlement Region

The Inuvialuit Living History (ILH) project is a community based archaeology initiative that brings together Inuvialuit knowledge holders, archaeologists, and other heritage specialists to identify culturally appropriate ways to create, document, and disseminate Inuvialuit heritage in the digital realm. Many Inuvialuit have expressed their desire for improved access to their archaeological and cultural heritage resources (Kelvin 2016). The project aspires to contribute to cross-cultural understanding by creating Inuvialuit oriented online resources that help to mobilize and share Inuvialuit traditional knowledge both within the community and with others around the world who may be interested in learning about Indigenous cultures in the Arctic region. This thesis will contribute to these ILH project objectives by investigating the effectiveness and implications of using Google Earth to create an interactive digital map to document and share Inuvialuit traditional knowledge primarily with Inuvialuit youth and other Inuvialuit community members, but also with interested members of the general public.

Traditional life for Inuvialuit was oriented around land-based activities such as hunting, fishing, and berry picking. Because of the spatial nature of these activities and the importance of place in ongoing interactions between past and present (Bielawski, 1989; Briggs, 1992; Kelvin, 2016; Lyons, 2010), an interactive digital map has good potential to convey traditional knowledge and cultural heritage information in a way that uniquely aligns with Inuvialuit epistemology and worldviews. Interactive digital maps augment geographic information with descriptive text, photographs, videos, and other forms of digital expression to create virtual representations of places that we can navigate using computers and mobile devices.

1.2 A brief history of Inuit involvement in Arctic archaeology

Archaeology is the study of material remains left by people in the past as a result of their daily activities. Archaeological interest in the Canadian Arctic increased with the arrival of European explorers and traders over 200 years ago, with early explorers inquiring about Inuit history and cultural development (Rowley, 2002). As the number of whalers, traders, and missionaries in the region increased, so did the frequency of instances where cultural artifacts began to appear in museums in Europe and North America (Rowley, 2002; Lyons, 2013). In the early 1900's American Anthropologist Franz Boaz notably characterized these archaeological materials as "valuable" (Rowley, 2002). Initially, the Inuit themselves capitalized on this interest by assembling collections of artifacts for trade. However, following the Danish Fifth Thule Expedition (1921-1924) which was the first systematic archaeological endeavor in Nunavut, the Canadian Government began to institute legislative restrictions and controls on archaeological excavations. In the decades following World War II, the Inuit became increasingly alienated from control over archaeology and their cultural history (Rowley, 2002). Throughout this period the Inuit were typically excluded from contributing their knowledge to the interpretation of archaeological findings, experienced the removal of cultural artifacts from their lands

without consultation or consent, and were given little or no access to post-excavation research findings (Lyons, 2013; Kelvin, 2016). The cumulative effect of these actions was the marginalization of the Inuit people themselves that was attributable to archaeological interpretations that portrayed them to be a static “prehistoric” people who lived in the largely uninhabited frontier of the Canadian North (Karim-Aly, 2001; Kelvin, 2016). Daniel Weetaluktuk, the first Inuk archaeologist from Nunavik, characterized these negative impacts as follows:

“Too often, in the past some archaeologists have come up North, excavate, then leave after having had minimal contact with the Inuit population. To this extent, they [archaeologists] don't bother to show the natives, the artifacts from their digs. This also results from the general lack of interest by some local people. Some of you might say, what good will it do to show these ignorant natives the finds. On an archaeologist's part, at least taking time to explain to the Inuit of the concerned area would better the relations of the two groups at this level. Some archaeologists, working in the Arctic have been cooperative, as it should be all the time. But some Inuit have had to put up [with] shabby treatment just because they know less about archaeology in scientific terms, seemingly because that some pre-historians have forgotten the humanistic values which were the very reasons for the existence of the Inuit, as it is clearly shown by their arts and tools.”
Daniel Weetaluktuk (1978).

Since the late 1970s, the Inuit have increasingly regained control over archaeological work done on their traditional lands. A series of legislative and political changes including, the Inuvialuit Final Agreement (1984), the Nunavut Land Claim Agreement in 1993, the Labrador Inuit Land Claim agreement in 2005, and the Nunavik Inuit Land Claim Agreement have given the Inuit more direct control and administrative responsibility for their lands (Lyons, 2013; Kelvin, 2016). A new permitting process specific to archaeological research was initiated in 1977. Administered through the NWT Cultural Places Program at Prince of Wales Northern Heritage Centre it requires community consent before archaeological investigations can proceed. The Inuvialuit Final Agreement likewise gave Inuvialuit control over other types of research conducted on their lands, through a permitting process overseen by the Aurora Research Institute. Inuit control over research on their lands has been further reinforced by the recent establishment of the National Inuit Strategy on Research in 2018

(<https://www.itk.ca/national-strategy-on-research/>) which defines a framework of partnership, collaboration, and actions related to Inuit oriented research.

These changes also contributed to a significant shift in archaeological methods towards community-based archaeology -- a modern hybrid approach that incorporates Western science and technology with various aspects of local community knowledge and culture to produce more multi-dimensional interpretations of the archaeological record (Nicholas & Andrews, 1997; Griebel, 2010; Lyons et al, 2010; Lyons, 2013; Lyons, 2016).

Through these collaborative efforts, community archaeology seeks to share control of decision making related to the production of cultural heritage information resources and to address the questions, interests, and needs of local communities rather than those of external institutions and researchers. Successful collaborative archaeology projects incorporate local perspectives in the interpretation of the archaeological record in ways that distinctly differ from earlier Western rationalist and materialist perspectives that emphasized technological advances and other economic contributions (Lyons, 2013). Indigenous archaeology refers explicitly to archaeological projects undertaken with, for, and by Indigenous people (Colwell-Chanthaphonh et al., 2010; Lyons, 2013; Nicholas & Andrews, 1997; Watkins, 2000). Through such collaborative endeavors, Indigenous communities are becoming increasingly prominent in the joint creation, interpretation, and dissemination of their cultural heritage, which is helping to further break down cultural barriers (Atalay, 2008; Colwell-Chanthaphonh et al., 2010; Lyons, 2016; Nicholas & Andrews, 1997). This approach can also help to shift the focus away from colonial interest in documenting the distant “pre-contact” past and toward developing shared understandings of the recent past that may be useful to contemporary Indigenous communities (Lyons, 2016). Indigenous archaeology is a form of community-based archaeology that seeks to specifically integrate Indigenous community perspectives and values into the production of archaeological knowledge and can also produce research outcomes that supersede outdated Western archaeological practices (Atalay, 2006, Nicholas & Andrews, 1997).

However, Indigenous people have different worldviews and experiences with archaeology, history, and the preservation of their cultural heritage from their Western

counterparts (Atalay, 2008). In many Indigenous communities, there is no compelling desire to uncover the past through archaeological excavation for display in museums because it is perceived to be already part of the contemporary world (Nicholas & Andrews, 1997). Another distinguishing characteristic of their worldviews is the notion that multiple understandings of any past or present can be both valid and desirable due to different points of view and experiences (Atalay, 2008). This expectation of “multivocality” necessitates different approaches to collaboration with local communities in the co-development of research agendas that incorporate both Indigenous and Western scientific methods and focus on the needs and interests of the local community (Atalay, 2008; Habu et al., 2007;2008).

1.3 Digital community engagement

Information Technology can facilitate new ways for Indigenous communities to engage with archaeological research and manage their cultural heritage. Digital archaeology utilizes information technology and other digital methods in the archaeological process and outcomes of creating new knowledge about the past (Morgan & Eve, 2012). Digital archaeologists are creating new ways to represent and facilitate access to the past through virtual collaborative environments, online learning applications, and other three-dimensional (3D) models (Gill, 2009). In Africa, archaeologists and heritage organizations are using the internet to enable individuals and communities who have been distanced from their cultural heritage as a result of conflict or famine-induced migration to be able to reconnect with their cultural heritage (Basu, 2011). In the South Pacific, the digital replication of sacred carvings is enabling Indigenous communities to remain connected with heritage objects that would otherwise be inaccessible because it is considered dangerous to come in physical contact with them (Were, 2014). Websites and social media have been used by a community based research team in British Columbia to create an appealing bridge between Western science and Sq'ewlets traditional culture, particularly for Indigenous youth (Lyons et al., 2016). Digital strategies have also been used effectively in the Arctic. Photogrammetry has been used to enable Inuvialuit communities to participate more directly in the interpretation, understanding, and traditional uses of artifacts (Haukaas & Hodgetts, 2016). Virtual Reality (VR) has

similarly enabled Inuit Elders to interact with digital recreations of the past in ways that would not otherwise be achievable through static museum displays (Dawson et al., 2011).

However, the implications of using digital methods are not always positive. The need for specialized technical skills for the deployment of these technical solutions can further perpetuate colonial power inequalities that have historically existed between Western “specialists” and Indigenous peoples (Haukaas & Hodgetts, 2016). Digital recreations of cultural heritage can create new intellectual property concerns for Indigenous communities who may wish to avoid the misappropriation or commodification of sensitive cultural materials on the public internet (Brown & Nicholas, 2012; Christen, 2011). While the internet plays a crucial role in connecting people in Canada across large distances with relatively low population densities (Warf, 2011), it is not universally available. The “digital divide” refers to a theoretical distinction between those who have the skills and capacity to access internet technologies and those who do not. There are a variety of socio-economic factors including population density, commercial potential, geographic location, average household income, and level of government support that can combine to influence the degree to which information and communications technology (ICT) infrastructure is available within a particular region (McMahon, 2014). The deployment of ICT infrastructure is typically based on a “hub and spoke” model where service is first delivered to larger centers and then radiated concentrically outward to smaller peripheral communities based on population density and economic viability. Because of this iterative cycle of assessment and deployment, ICT infrastructure has spread unevenly across the globe. Until recently, the circumpolar North has been largely peripheral to the core of the internet (Warf, 2011). Many northern Indigenous communities continue to deal with limited access to computers and high-speed internet (Dawson et al., 2016). The Federal Government of Canada has taken steps to address this problem. The Government of Canada's digital strategy (2018), *Connecting Canadians*, aims to increase high-speed internet and broadband access for all Canadians in remote, rural and northern parts of the country that will enable them to access social media tools like YouTube or FaceTime and to take advantage of other e-commerce, distance education or employment opportunities.

1.4 Inuvialuit Traditional Knowledge and Epistemology

The Inuvialuit Cultural Centre (ICC) is a key community partner in the Inuvialuit Living History project. The ICC is particularly interested in promoting and revitalizing Inuvialuit traditional knowledge and language (Inuvialuit Regional Corporation, n.d.). Traditional knowledge (TK) for the Inuvialuit refers to a large body of knowledge about Inuvialuit traditional ways of life including tool & craft making, subsistence activities, rhythms and modes of seasonal transportation, place names, legends, stories, and language. According to the ISR Traditional and Local Knowledge catalog (<http://isrtlk.com/>),

“Traditional Knowledge is defined as a shared, collective body of knowledge incorporating environmental, cultural and social elements. Therefore, Traditional Knowledge is a combination of traditional environmental knowledge, traditional land use, and traditional practices. It is a continuous body of knowledge passed on from generation to generation and continues to grow and evolve over time. The fact that Traditional Knowledge is continuous and evolving over time reflects the incorporation of current knowledge into Traditional Knowledge. Local Knowledge (LK) is current knowledge held by people within a community. It can be gained by any individual who has spent considerable time on the land or water observing nature and natural processes.”

Inuvialuit TK can also be described as cumulative, evolving, and experiential. It encompasses knowledge that is orally transmitted from person to person, across generations, often in the context of actively performing a particular task. TK represents the total aggregation of memories, skills, and experiences related to living, hunting, and fishing as Inuvialuit. Inuvialuit TK recognizes and celebrates diversity and does not hold any single memory, skill, or experience to be representative of the entire Inuvialuit culture. Thus, it is a specialized form of local knowledge that is intricate, dynamic, and highly nuanced.

Inuit Qaujimajatuqangit (IQ, Inuit knowledge) is an Inuktitut term that describes “what Inuit have always known to be true” – the Inuit ways of knowing and being in the world (Karetak et al., 2017; Lyons et al., 2010). These epistemologies and ontologies serve a crucial role within Inuit society that helps to connect people to places, events, and activities in the past as well as the future through memories and storytelling (Lyons et al.,

2010). Inuit communities are based upon the strength of social and economic relationships between individuals and families that are integrally interconnected with hunting and fishing (Collignon et al., 2006; Lyons et al., 2010). Inuit, similar to many other Indigenous groups, conceive and internalize the landscape as complex “mental maps” that reflect daily travel routes, traditional place names, as well as food, shelter, and other potential resource sources (Tobias, 2000; Ingold, 2004; Lyons et al., 2010). These mental maps also serve a vital role in helping Inuit to recall and relay information about the past through vivid oral storytelling (Lyons et al., 2010). Storytelling and oral history play a central role in the transfer of traditional knowledge between individuals and across generations, but traditional skills and knowledge are learned through a combination of listening, observation, and direct hands-on experience.

Community-based archaeology projects that recognize these unique Inuit worldviews can engage Inuit communities in more meaningful discussions about the interpretation and meaning of artifacts, rather than merely in the process of their excavation (Griebel, 2010). The Inuvialuit Archaeology Partnership, a precursor to the Inuvialuit Living History Project, is an excellent example of research that highly values the oral histories of Elders as cultural insiders (Lyons, 2013). Inuvialuit Elders hold unique perspectives that can provide invaluable contributions to archaeology projects. They respect and value the ingenuity and skills of their ancestors, but at the same time seek to pragmatically share learnings from the past to inform the present and improve the future as new information, ideas, and technologies become available (Lyons et al., 2010; Lyons, 2013). They appreciate the historical significance of artifacts but also value the memories that they invoke, and the stories that they elicit. Because these Elders perceive artifacts within their particular cultural or historical context, rather than as isolated objects, they can provide invaluable contributions to the development of more culturally appropriate interpretations of archaeological findings.

1.5 Digital mapping of traditional knowledge and heritage

Digital maps can be particularly useful in recording Indigenous traditional knowledge because of the culturally significant connections with the landscape that they can portray (Taylor & Pyne, 2010). “Cybercartography” and “deep mapping” are other terms that have been used to describe digital mapping (Taylor & Pyne, 2010; Earley-Spadoni, 2017). A deep map is a multi-layered cartographic representation that uses multi-media to digitally illustrate geographical and social spaces in various ways (Earley-Spadoni, 2017). These multiple layers can be used in archaeology to represent multi-vocal perspectives about the geography and historical context of particular locations on the map (Earley-Spadoni, 2017). Digital maps can thus facilitate a particular form of archaeological storytelling which seeks to incorporate illustrations of personal narratives and stories by way of photography and other audio-visual elements into the representation of a particular past activity, place, or object (Cunsolo et al, 2013).

Inuit have been partners in several digital cartography initiatives related to traditional knowledge, including traditional place names, sea ice movement patterns, and other historical travel routes (Engler et al., 2013). For example, the Sea Ice Atlas (<http://sikuatlas.ca/index.html>) documents traditional knowledge about sea ice characteristics, usage, and observed changes around Baffin Island over time. The Fifth Thule Expedition Atlas (<https://thuleatlas.org/index.html>) is another interesting example that enables users to virtually follow the travel route used by Rasmussen and to access detailed information about Inuit oral traditions, traditional place names, language, and hand-drawn maps, as well as other photographs, and cultural objects from the expedition's records. The Kitikmeot Place Names Atlas (<https://atlas.kitikmeotheritage.ca/index.html>) combines linguistic and geographic information about traditional place names by incorporating traditional Inuktitut language stories from Elders' in Nunavut. Local Inuit communities have actively guided and shaped these mapping initiatives because of their ability to convey traditional knowledge both visually and linguistically in ways that are uniquely meaningful to them (Engler et al., 2013).

One important aspect of cartography is that the processes of making and using maps are inherently subjective (Monmonier, 1996). The skills of the map maker can directly influence the creation of a digital map or any other digital representation of the past - as can the skills, age, and expectations of the map user (Carter, 2017; Ingold, 2007). The map itself can also affect those using it - to evoke memories or to solicit storytelling. Map creators can produce several maps of the same geographic area based on different understandings of the landscape, different objectives for the map, and other political motivations (Monmonier, 1996). Similarly, these maps can be interpreted in various ways by those using them (Monmonier, 1996). Indigenous communities possess unique knowledge, skills, and experiences that are different from the background knowledge, interpretations, and other “scaffolding” assumptions that archaeologists and others might have (Wylie, 2017). In taking a community-based approach, archaeologists have the opportunity to mitigate these subjectivities by orienting the design of maps around the specific needs and perspectives of the primary intended audience, in this case, the Inuvialuit community. This methodology will help to reduce the potential for misrepresentation and misinterpretation of the map in both its construction and use, as a result of the subjectivity of differing viewpoints.

1.6 Google Earth applications and success stories

Numerous digital mapping technologies and solutions can be used in map making projects today. Therefore, my first step was to decide on a target software platform for my research mapping project. Graphical Information Systems (GIS) are specialized technologies that capture, store, manipulate, analyze, manage, and spatially present geographic data. I considered using GIS solution options such as NASA's World Wind (<https://worldwind.arc.nasa.gov>) which is a free, open-source system for visualizing and hosting geospatial data and ESRI's ArcGIS (<https://www.esri.com/en-us/arcgis/about-arcgis/overview>) which is a comprehensive mapping and spatial analytics solution. While these software options offered sophisticated mapping features and functions, they also required additional investment in technical training and essential background knowledge in GIS mapping principles to be used effectively.

I also evaluated Google Earth (<https://www.google.com/earth/>) as an alternative platform, which accesses satellite and aerial imagery, ocean bathymetry, and other geographic data over the internet to represent the Earth as a three-dimensional globe. While not strictly a GIS system, Google Earth is widely used as a digital mapping tool. Google Earth is a particularly compelling solution to use for this digital mapping research project because the software is free and easily usable by members of the general public without the need for extensive technical training or background knowledge in GIS mapping. Google, as one of the largest technology companies in the world, has also engineered the Google Earth platform to work on multiple mobile and PC platforms. The software is also designed to enable individual users to incorporate content into Google Earth maps themselves.

Researchers have successfully used Google Earth in a variety of ways as a tool for mapping cultural heritage and archaeological information in other contexts. The Surui tribe have used Google Earth in the Amazon to document and record stories about their cultural history (Google Earth Outreach, 2019). In the Russian Far East, researchers used Google Earth in the Indigenous-Kamchatka Digital Atlas Project to preserve stories spoken in the endangered Itelmen language about significant cultural places along the western coast of Kamchatka (Thom et al., 2016). On Easter Island, Google Earth has been used by researchers to collaborate on archaeological research and to share their findings with interested members of the general public (Hochstetter et al., 2011). Google Earth was used in the Stonehenge Riverside Project to create annotated video tours of the Stonehenge site that would allow interested visitors to “virtually” tour this famous landmark without having to physically travel there (Welham et al., 2015). Lastly, and of particular relevance to this research, archaeologists and members of the Caribou Inuit communities surrounding Arviat, Nunavut have collaborated through the Arviat archaeology and Oral History Project (<https://www.arcticiq.ca/>) on an online interactive mapping project which incorporates traditional knowledge, place names, and other heritage information using a variety of web, social media, and mapping platforms including Google Earth (Lyons et al., 2010).

Another benefit of using Google Earth is that teachers and students have also used the tool as an educational resource in a variety of classroom and pedagogical contexts. Individuals can learn through their virtual exploration of places, cultures, and geographic areas by using digital mapping tools like Google Earth. For example, teachers can incorporate Google Earth-based National Geographic lesson plans, maps, and other reference sources into their teaching (National Geographic, 2019). Students can learn using other Google Earth related tools such as Google Voyager which allows them to virtually explore different places and cultures through a computer (Google Earth Education, 2019). The United Nations Environment Programme (UNEP) has used Google Earth as a tool to help educate the public to better understand the impact and scale of global environmental issues (Google Earth Outreach, 2019).

I selected Google Earth as the development platform for my project because it is free, widely used in a variety of public interest and educational contexts, and designed to allow individuals to participate in the co-development of the map by adding content themselves rather than needing to rely on others for technical expertise and assistance.

1.7 Research Objectives

In the fall of 2017, a planning meeting was held in Vancouver as a kickoff to Phase 2 of the Inuvialuit Living History project. The Inuvialuit Cultural Resource Center, represented at the meeting by two staff, was instrumental in shaping the Phase 2 project outcomes. They also oversaw the selection of an Inuvialuit Elder to participate in and guide the discussions. One of the central ideas that emerged from that planning meeting was the creation of an interactive map that would incorporate information about Inuvialuit TK and archaeological history. My Masters research aims to make recommendations to guide the development of such a map by answering the following research questions:

1. Why do Inuvialuit perceive an interactive digital map to be an effective way to document and sharing their Traditional Knowledge, archaeological history, and cultural heritage?

2. How should the content of such a map be organized to facilitate ease of access in ways that are meaningful to Inuvialuit?
3. What are the benefits and other implications of using a digital strategy to engage Inuvialuit youth in learning about traditional knowledge, as well as to share this knowledge online with others who may also be interested in learning about Inuvialuit culture and heritage?

Ultimately, the implementation of these recommendations in the development of the final map by the ILH project will enable Inuvialuit and others to access Inuvialuit and archaeological knowledge about Inuvialuit cultural sites. This research can therefore contribute to improved access for Inuvialuit to their heritage and will support the development of tools for educating other Canadians about Inuvialuit culture and heritage.

My thesis research will also contribute a localized example of digital archaeology to anthropological scholarship that utilizes a community-based archaeological approach to integrate traditional Indigenous values and knowledge within a modern digital technology platform. The methodology and key findings from this research could be applicable to other Indigenous contexts with similar objectives. It can also help to rebalance the colonial power structures that underlie archaeological research in settler contexts like Canada (Basu 2011; Boast 2011; Christen 2006; Dawson et al, 2011; Lyons et al, 2016).

1.8 Research Methodology

My approach to the research was designed to allow Inuvialuit to experience a spectrum of possibilities for digital mapping of TK and subsequently to provide direction on whether and how such a map should be designed to be most useful to the community.

This was challenging for me personally. I was a mature student with an extensive background in business and information technology, but I lacked field experience in both archaeology and ethnography and had never been to the ISR or the Arctic. As a non-Indigenous outsider, I was concerned about my ability to build trust and rapport with the

community within the relatively short research time frame available for my master's degree.

1.8.1 Research Ethics and Licensing

My first step was to secure Research Ethics approval from the University to engage the Inuvialuit community in discussions about the map (See Appendix A1). Included in my ethics protocol were participant recruiting materials, interview and student engagement activity plans, as well as Letters of Information and consent. I also acquired a Scientific Research License from the Aurora Research Institute in the North West Territories (See Appendix A2). This research license process allows Inuvialuit to explicitly monitor and control any research activities that occur on their lands. My research license permit request included the details of my research plan, as well as my University approved ethics protocol. These materials were forwarded to various community town councils and other regulatory bodies for a consultation period of 60 days.

1.8.2 Building a Prototype map

Having made the decision to use Google Earth, my next key decision was to build an initial prototype map that would serve as a backdrop for discussions with Inuvialuit community members and other stakeholders. This decision was based on consultation and feedback from colleagues on the ILH project. The rationale was that the prototype would help to provide people with something to react to as a conversation starter about their needs and interests in the map. The prototype would also help to demonstrate the basic functionality of digital maps for those that may be unfamiliar with these systems and to outline some possible ways that traditional activities, places, and stories could be digitally represented.

I incorporated 6 sample archaeological and urban sites from across the ISR into the prototype to exhibit, each with varying levels of user interaction. Sample sites exhibiting lower user interaction levels contained photographs with basic audio and text clips, while other more sophisticated site examples featured YouTube video clips, 360° photospheres with adjustable camera views and interactive 3D models. I assembled the sample digital

content for these sites from existing archaeological research done on Banks Island (Agvik and Cape Kellett) and other public websites and platforms such as Sketchfab (for 3D models). I also experimented with photogrammetry to develop an interactive 3D model of an artifact for potential use in the map. While I was able to produce a working model, I was not able to technically integrate it into Google Earth because of lack of space and processing optimization within the model. It is possible to integrate 3D models directly into Google Earth, but only if their technical design has been highly compressed and streamlined to utilize minimal storage and computer processing resources.



Figure 2: Prototype Google Earth Map

Using Keyhole Markup Language (KML) and Google online resources

(<https://developers.google.com/kml/>), I programmed (see figure 3) different arrangements of multi-sensory digital content into each placemark to exhibit varying levels of user interaction.

<hr>

Agvik (OkRn-1) is located approximately 50 km southeast along the coast from Cape Kellett on a high bluff overlooking Amundsen Gulf. It includes the remains of 14 dwellings. </br> </br> The coastline is eroding due to rising water levels and global climate change.

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<h3><i><u>Artifacts and Heritage</u></i></h3>
<h5>Baleen Strap</h5>

<h5>Hafted Shaft</h5>

<h5>Arrow Point</h5>

<h5>Polar Bear Tooth Pendant</h5>

<h5>Fishing Lures</h5>

<h5>Harpoon Points</h5>

<h5>Bone Tools</h5>


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Figure 3: KML Code sample (simple text and photographs)

Through this process, I encountered a few technical design and programming issues. From a technical design perspective, I needed to ensure that the digital content that I wanted to display for each site would function correctly within the available internet infrastructure capacity in the ISR. Wherever possible, I configured photographs and text to be cached within local KML files that could be accessed by computers in the ISR without the internet. In other cases, however, it was necessary to rely on internet based content. As a result of slow internet access speeds, I was not able to incorporate complex 3D models into the prototype and consequently had to use simpler archaeological 3D models that had already been published in Sketchfab. I also encountered some difficulty in configuring audio files to play at the appropriate time in the user experience for certain placemarks.

A brief visual tour of the prototype can be found in Appendix D.

1.8.3 Approach to engaging the Inuvialuit Community

The most critical phase in my research process was to respectfully and effectively engage a broad cross section of the Inuvialuit community in discussing the potential for the map. I felt that it was crucial to focus these discussions on the interests and needs of the community relative to their traditional knowledge, rather than on the technology related matters. Fortunately, my research was part of the larger Inuvialuit Living History project and therefore I was able to participate in two larger ILH project events that allowed me to engage a variety of individuals from all age groups in casual conversations about the map and about places, activities, Inuvialuit traditional knowledge and archaeological history. These opportunities for informal discussion were invaluable as they allowed me to establish connections and build rapport with several individuals in the community, which paved the way for subsequent more formal and structured conversations about the purpose and design of the map.

I conducted these community consultations over two separate timeframes and contexts. The Great Northern Arts Festival is an annual summer event held in Inuvik, Northwest Territories that brings together artists and community members from across the ISR as well as many interested visitors from the general public. The ILH team set up an information booth about the project during the festival, with the prototype map on display on a laptop. The display helped to facilitate numerous informal discussions with Inuvialuit Elders, other community members, and the general public about archaeology, cultural heritage, and digital mapping. In late September, ILH hosted a community gathering in Inuvik, which again brought together Inuvialuit Elders from across the ISR and students from East 3 School to engage in Inuvialuit cultural activities and explore Inuvialuit artifacts. At this time, I arranged a series of informal discussions, one focus group meeting, and two formal classroom workshops involving digital mapping with high school students in Inuvik and Tuktoyaktuk. During these periods, I conducted five semi-structured interviews in Inuvik and Tuktoyaktuk with eight Inuvialuit Elders and other traditional knowledge holders who had come from a variety of communities in the ISR to further discuss the purpose, design, structure and content of the interactive map. A summary of these interviews and other activities can be found in Appendix B.

The results gathered from the prototype development exercise and these interviews and classroom workshops form the primary basis for the research findings presented in this thesis.

1.9 Thesis Organization

This thesis is written in integrated article format. It is comprised of two standalone articles, Chapters 2 and 3, exploring the effectiveness of using Google Earth to document Inuvialuit knowledge and the implications of such a digital map on Inuvialuit teaching and learning. This chapter, Chapter one, provides the overall background and context for the research.

Chapter two critically evaluates the effectiveness and implications of using Google Earth as a means of preserving and sharing Inuvialuit traditional knowledge. Drawing on direct input from the community, this chapter demonstrates why a digital map appeals so strongly to Inuvialuit and can reflect key aspects of traditional knowledge such as personalized story-telling and connecting traditional activities to their geographic context. Chapter two also examines several of the challenges that can arise from representing traditional knowledge in a digital environment and sharing that information online.

Chapter Three elucidates Inuvialuit pedagogy and critically evaluates how well a Google Earth map can support traditional modes of Inuvialuit teaching and learning through listening, observation, and hands on experience. This chapter also demonstrates how a digital map can be particularly effective in engaging Inuvialuit youth with their cultural heritage through the use of technology.

Chapter Four synthesizes the key findings from both analyses into a set of conclusions, technical design requirements, and implementation guidelines that can be used by the Inuvialuit Living History project. It also documents some suggestions about how this research could be applied in other Indigenous community contexts where digital mapping could also add value.

1.10 References

- Atalay, S. (2008). Multivocality and Indigenous Archaeologies beyond Nationalist: Global applicability of Indigenous Archaeologies. In M. J. M. Habu J., Fawcett C. (Ed.), *Evaluating Multiple Narratives*. Springer, New York, NY. 29-44.
- Basu, P. (2011). Object Diasporas, Resourcing Communities: Sierra Leonean collections in the global Museumscape. *Museum Anthropology* 34(1):28-42.
- Bollwerk, E. (2015). Co-Creation's Role in Digital Public Archaeology. *Advances in Archaeological Practice*, 3(3), 223–234.
- Boast, R., & Enote, J. (2013). In *Heritage in the Context of Globalization: Europe and the Americas*, edited by P.F. Biehl and C. Prescott, 103-113. Springer Briefs in Archaeology 8. New York: Springer.
- Bielawski, E. (1989). Dual Perceptions of the Past: Archaeology and Inuit Culture. In *Conflict in the Archaeology of Living Traditions*, R. Layton, ed. pp. 228-236. London: Unwin Hyman.
- Briggs, J. (1992). Lines, Cycles and Transformations: Temporal Perspectives on Inuit Action. In *Contemporary Futures: Perspectives from Social Anthropology*, edited by Sandra Wallman, pp.83-108. London: Routledge.
- Brown, D., & Nicholas, G. (2012). Protecting Indigenous cultural property in the age of digital democracy: Institutional and communal responses to Canadian First Nations and Māori heritage concerns. *Journal of Material Culture*, 17(3), 307–324.
- Canadian Radio-television and Telecommunications. *Closing the Broadband Gap*. Retrieved from: <https://crtc.gc.ca/eng/internet/internet.htm> (accessed May 1, 2019).
- Carter, W. M. (2017). Getting to the point: Making, Wayfaring, Loss and Memory as Meaning-making in Virtual Archaeology. *Virtual Archaeology Review*, 8(16), 97-102.
- Collignon, B., Weber Müller-Wille, L., & Canadian Circumpolar Institute. (2006). *Knowing places: The Inuinnait, landscapes, and the environment*. Edmonton, AB: Canadian Circumpolar Institute (CCI) Press.
- Colwell-Chanthaphonh, C., Ferguson, T. J., Lippert, D., McGuire, R. H., Nicholas, G. P., Watkins, J. E., & Zimmerman, L. J. (2010). The premise and promise of Indigenous archaeology. *American Antiquity*, 75(2), 228-238.
- Christen, K. (2006). Ara Irititja: Protecting the Past, Accessing the Future—Indigenous Memories in a Digital Age. *Museum Anthropology*, 29 (1):56–60.

Christen, K. (2011). Opening Archives Respectful Repatriation. *The American Archivist*, 74(1), 185–210.

Cunsolo Willox, A., Harper, S. L., & Edge, V. L. (2013). Storytelling in a digital age: digital storytelling as an emerging narrative method for preserving and promoting Indigenous oral wisdom. *Qualitative Research*, 13(2), 127–147.

Dawson, P., & Levy, R. (2016). From Science to Survival: Using Virtual Exhibits to Communicate the Significance of Polar Heritage Sites in the Canadian Arctic. *Open Archaeology*, 2, 209–231.

Earley-Spadoni, T. (2017). Spatial history, deep mapping and digital storytelling: archaeology's future imagined through an engagement with the Digital Humanities. *Journal of Archaeological Science*, 84, 95–102.

Engler, N. J., Scassa, T., & Taylor, D. R. F. (2013). Mapping traditional knowledge: Digital cartography in the Canadian north. *Cartographica: The International Journal for Geographic Information and Geovisualization*, 48(3), 189-199.

Gill, A. A. (2009). Digitizing the Past: Charting New Courses in the Modeling of Virtual Landscapes. *Visual Resources*, 25(4), 313–332.

Google Earth Education (2019). Retrieved from: https://www.google.com/intl/en_ca/earth/education/inspiration/ (accessed May 1, 2019).

Google Earth Outreach (2019). Retrieved from: <https://www.google.com/earth/outreach/success-stories/unep-atlas-of-changing-environment/> (accessed May 1, 2019).

Government of Northwest Territories. (n.d.). Retrieved from: <https://www.eia.gov.nt.ca/en/priorities/concluding-and-implementing-land-claim-and-self-government-agreements/inuvialuit> (accessed August 15, 2019).

Griebel, B. (2010). A conflict of interest: A case study for Community Archaeology in Nunavut, Canadian Arctic. *Museum International*, 62(1-2), 75-80.

Habu, J., Fawcett, C., & Matsunaga, J. M. (2007;2008;). *Evaluating multiple narratives : Beyond nationalist, colonialist, imperialist archaeologies*. New York, NY: Springer New York.

Ingold, T. (2004). Culture on the ground: The world perceived through the feet. *Journal of Material Culture*, 9(3), 315-340.

Ingold, T. (2007). Materials against materiality. *Archeological Dialogues*, 14(1), 1–16.

Inuvialuit Settlement Region Traditional and Local Knowledge Research Publication Catalogue. (n.d.). Retrieved from: <http://isrtlk.com/> (accessed May 1, 2019).

- Inuvialuit Regional Corporation. (n.d.). Retrieved from: <https://www.irc.inuvialuit.com/> (accessed May 1, 2019).
- Karim-Aly, K. (2001). North of 60: Homeland or frontier? In D. Taras and B. Rasporich. (eds). *A Passion for Identity: Canadian Studies for the 21st Century*. Ontario: Nelson Thomson Learning. 433-455.
- Karetak, J., Tester, F. J., & Tagalik, S. (2017). *Inuit qaujimajatuqangit: What inuit have always known to be true*. Winnipeg; Halifax: Fernwood Publishing.
- Kelvin, L. (2016). There Is More Than One Way to Do Something Right: Applying Community-Based Approaches to an Archaeology of Banks Island, NWT. *Electronic Thesis and Dissertation Repository*. 4168. <https://ir.lib.uwo.ca/etd/4168>
- Lyons, N., Dawson, P., Walls, M., Uluadluak, D., Angalik, L., Kalluak, M., ... Suluk, L. (2010). Person, place, memory, thing: How Inuit Elders are informing archaeological practice in the Canadian North. *Canadian Journal of Archaeology*, 34(1), 1-31.
- Lyons, N. (2013). *Where the wind blows us: Practicing critical community archaeology in the Canadian North*. Tucson: University of Arizona Press.
- Lyons, N. (2016) Part 1: Archaeology and Native Northerners: The Rise of Community-Based Practice across the North American Arctic. In *The Oxford handbook of the prehistoric Arctic*, edited by Friesen, T. M., & Mason, O. K New York, NY: Oxford University Press, pp. 1-27.
- Lyons, N., Schaepe, D. M., Hennessy, K., Blake, M., Pennier, C., Welch, J. R., ... Pennier, C. (2016). Sharing deep history as digital knowledge: An ontology of the Sq'ewlets website project. *Journal of Social Archaeology*, 16(3), 359–384.
- McMahon, R. (2014). From digital divides to the first mile: Indigenous peoples and the network society in Canada. *International Journal of Communication*, 8(1), 2002-2026.
- Monmonier, M. S. (1996). *How to lie with maps* (2nd ed.). Chicago: University of Chicago Press.
- Morgan, C., & Eve, S. (2012). DIY and digital archaeology: What are you doing to participate? *World Archaeology*, 44(4), 521-537.
- National Geographic, Education (2019). Retrieved from: <https://www.nationalgeographic.org/education/google-earth/> (accessed May 1, 2019).
- Nicholas GP, Andrews TD. (1997). *At a Crossroads: Archaeology and First Peoples in Canada*. Vol no. 24. Burnaby, B.C: Archaeology Press.

Rowley, S. (2002) Inuit Participation in the Archaeology of Nunavut: A Historical Overview. In *Honoring Our Elders: A History of Eastern Arctic Archaeology*, edited by William W. Fitzhugh, W.F., Loring, S. & Odess, D. Contributions to Circumpolar Anthropology No. 2. Arctic Studies Center, National Museum of Natural History, Smithsonian Institution, Washington DC. pp. 261–272.

Statistics Canada. 2018. *Inuvialuit region [Inuit region], Northwest Territories (table). Aboriginal Population Profile. 2016 Census*. Statistics Canada Catalogue no. 98-510-X2016001. Ottawa. Released July 18, 2018.

<http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/abpopprof/index.cfm?Lang=E> (accessed May 30, 2019).

Taylor, D.R.F., & Pyne, S. (2010). The History and Development of the Theory and Practice of Cybercartography. *International Journal of Digital Earth*, 3(1), 2–15

Tobias, T.N. (2000). Chief Kerry's Moose: A Guidebook to Land use and Occupancy Mapping, Research Design, and Data Collection. Vancouver: Ecotrust Canada.

Thom, B., Colombi, B. J., & Degai, T. (2016). Bringing Indigenous Kamchatka to Google Earth: Collaborative digital mapping with the itelmen peoples. *Sibirica*, 15(3), 1–30.

Torres Hochstetter, F., Haoa, S. R., Lipo, C. P., & Hunt, T. L. (2011). A Public Database of Archaeological Resources on Easter Island (Rapa Nui) using Google Earth. *Latin American Antiquity*, 22(3), 385–397.

Watkins, J. (2000). *Indigenous archaeology: American Indian values and scientific practice*. Oxford; Walnut Creek, CA: AltaMira Press.

Warf, B. (2011). Contours, contrasts, and contradictions of the arctic internet: 1. *Polar Geography*, 34(3), 193.

Weetaluktuk, D. (1978). Canadian and Inuit Archaeology. Canadian Archaeological Association. Retrieved from: <https://canadianarchaeology.com/caa/node/3947> (accessed on May 1, 2019).

Welham, K. et al. (2015). Google Under-the-Earth: Seeing Beneath Stonehenge using Google Earth - a Tool for Public Engagement and the Dissemination of Archaeological Data. *Internet Archaeology*, 40.

Were, G. (2014). Digital Heritage, Knowledge Networks, and Source Communities: Understanding Digital Objects in a Melanesian Society. *Museum Anthropology*, 37(2), 133–143.

Chapter 2

2 Documenting Inuvialuit Traditional Knowledge using Google Earth

2.1 Introduction

The roots of archaeology in the Canadian Arctic can be traced back to European colonial expansion with explorers who became interested in Inuit artifacts and history. Initially, Inuit were willing to share and sometimes trade examples of their cultural heritage with these outsiders (Rowley, 2002). However, as more traders, whalers, and archaeologists arrived through the 1800s and into the early 1900s, Inuit became increasingly concerned about the removal of artifacts from their lands (Rowley, 2002; Lyons, 2013). The situation continued to worsen following the Second World War as Inuit found themselves excluded from archaeological excavations, the interpretation of findings, and the dissemination of post-excavation results (Rowley, 2002; Kelvin, 2016). Inuit have since increasingly regained control over archaeological work done on their traditional lands through their own efforts to shape, influence and utilize legislative changes such as new research permitting processes by the Prince of Wales Northern Heritage Centre (1977), the Inuvialuit Final Agreement (1984), the Nunavut Land Claim Agreement (1993), the Labrador Inuit Land Claim agreement (2005), and the Nunavik Inuit Land Claim Agreement (2006) (Kelvin, 2016). Coincident with these changes, Indigenous communities were also pressing for changes in the methods of archaeology that would emphasize collaboration and the integration of Western scientific methods with various elements of Indigenous traditional knowledge, oral history, and culture to produce more multi-dimensional interpretations of the archaeological record and past Inuit lifeways (Atalay, 2006; Atalay, 2008; Lyons et al, 2010, Lyons, 2016; Rowley, 2002). As a result of these forces, community-based archaeology projects now combine Indigenous values, knowledge, and practices with their Western equivalents and share control of the decision making related to the interpretation of the artifacts with Indigenous communities (Atalay, 2008, Colwell-Chanthaphonh et al, 2010, Lyons, 2013, Watkins, 2000, Nicholas & Andrews, 1997). However, Indigenous people have perspectives that differ from their Western counterparts about the purpose of archaeology, their history, and the value of

preserving their cultural heritage (Atalay, 2008). As a result of these differing perspectives, it can be challenging for members of community-based project teams to reach consensus on culturally appropriate and contextually specific approaches and technology tools that align with the particular needs, values, and objectives of the Indigenous communities involved.

The Inuvialuit Living History (ILH) project, which began in 2009, aims to create digital ways for the Inuvialuit community to document and share their cultural heritage. The current second phase of the project (2017-2022) is a partnership between the Inuvialuit Cultural Centre (ICC), Inuvialuit Communications Society, Parks Canada, Prince of Wales Northern Heritage Centre (PWNHC), University of Western Ontario, Ursus Heritage Consulting and Simon Fraser University. Inuvialuit are the Inuit people of Canada's western Arctic. Their home, the Inuvialuit Settlement Region (ISR), spans approximately 91,000 square kilometers in the Northwest Territories and the Yukon.

Traditional Inuvialuit ways of life are linked closely to a land-based lifestyle and the seasonal patterns of hunting and fishing (Collignon et al., 2006). Because of these strong ties to the land, an interactive digital map has the potential to serve as an effective means of documenting and sharing Inuvialuit traditional knowledge because of its ability to connect digital representations of their life experiences to the geographic locations where those activities occur in a way that mirrors this aspect of their worldviews.

2.2 Inuvialuit traditional knowledge and epistemology

Inuvialuit traditional knowledge (TK) is described in the ISR Traditional and Local Knowledge catalog as a shared, collective, and continuous body of knowledge that encompasses information about the environment, land use, and traditional practices that has been passed down from generation to generation over time. TK can also involve myths, legends, and spiritual connections, as well as the recollection of historical events and past cultural encounters with others in particular places (Stewart et al., 2004). TK is orally transmitted from person to person, often in the process of performing particular traditional activities. Storytelling, therefore, represents a fundamental mechanism for the transfer of traditional knowledge between individuals and generations (Eades, 2015). By

sharing stories, personal experiences, and also using traditional language, Inuvialuit are able to make connections between objects, activities, and places that may not otherwise be discernable to cultural outsiders (Lyons, 2013).

Inuvialuit epistemology is closely related to and interconnected with deeply held ties to the land because traditional knowledge is acquired over time through daily life experience - traveling, gathering, hunting, fishing, and making tools or clothing out on the land. Inuvialuit synthesize and internalize these experiences, along with a vast array of other information related to geography, weather patterns, seasonal wildlife migrations, resource harvesting strategies, traditional manufacturing techniques, family histories, and legends into sophisticated mental maps. Inuvialuktun language specialist Beverly Amos relates: *"We carry (these maps) in our heads. Since long ago, people have used maps - even people that don't read. People can remember things and share stories about places along their trapping routes - what they caught where - without paper maps."* Inuvialuit Elder, James Pokiak similarly described that he would remember landmarks such as lakes, ice rubbles (piles of ice-flow), and pingos from each time he was out traveling that he used to *"visualize the land in my mind in order to find my way back home."* These mental maps help to reinforce Inuvialuit social identity and memory by defining connections between people and their claim to their lands and the resources they exploit from them (Lyons et al., 2010). Place names play an important role in these mental maps because they often reflect the geographic characteristics, purpose, resource potential, or historical significance of particular places (Nuttall, 1992). Inuvialuit knowledge holder Shirley Elias noted that Inuvialuit connect easily with maps and know place names very well.

Inuvialuit TK represents an aggregation of multiple memories, skills, and experiences related to living, hunting, and fishing as an Inuvialuk. Inuvialuit Elders are typically careful to position their experiences and knowledge as their own, and not necessarily representative of their entire Inuvialuit community or culture. This "multi-vocal" perspective is a common characteristic of many Indigenous cultures that assists them in understanding the world and each other (Atalay, 2008). This worldview also differs distinctly from common Western European viewpoints that often promote a single more

Eurocentric interpretation of the past (Atalay, 2008). The acknowledgment of these differences represents an important component of Inuvialuit identity. Inuvialuit see themselves as similar in many ways to other members of their community, but they can also discern regional and individual differences that define what it is to be Inuvialuit. Darryl Nasogaluak (Traditional knowledge holder) explained that *“We are not all the same. They don’t use baleen here in Tuk, but they do 40-60 km up the coast for lashing and fishing nets. People in Tuk were very good wood craftsmen because of large supplies of driftwood. Kayaks here were well crafted, and light, but up north the kayaks are less well made because there wasn’t as much raw material to work with.”* He continued by noting other regional distinctions in subsistence activities – that the harvesting of beluga whales and net fishing would be typical in a coastal settlement like Tuktoyaktuk, whereas caribou hunting and lake fishing would be more prevalent in surrounding inland communities such as Inuvik. Shirley Elias added another dimension to this cultural complexity by noting that many traditions were not done exactly the same way and that TK was typically shared within the *“circle of family”*.

These variations can also relate to temporal and technological factors. In two separate accounts, I was told by Elders about changes in the traditional use and construction of dog sleds. One Elder told me that basket sleds were made initially long ago out of driftwood from the coastline and that a smaller team of dogs could easily manage these sleds because of their light weight. He further explained that the newer sleds were made out of wooden planks that were stronger but also required larger dog teams. The second Elder further detailed that Inuvialuit and others in the Western Arctic typically used Straight line (single) or Nome (2 x 2) harnesses for their dog teams to make it easier to navigate through the tree line. He also added that other Inuit from the Eastern Arctic typically ran their dogs in a fan hitch as a way of distributing the weight out more evenly across the ice.

Inuvialuit TK is continuously evolving. Elder Albert Elias emphasized that Inuvialuit TK is not static and that it continues to evolve with new tools, technologies, and methods. Lawrence Amos, another Inuvialuit Traditional Knowledge holder, emphatically noted that *“we are not dead yet, we are still here!”* These sentiments highlight that Inuvialuit

do not perceive the documentation of traditional knowledge as a preservation exercise. The accumulation of TK is not about creating time capsules of the past. It serves instead as an ongoing symbol of their community pride, resilience, and ingenuity to live and thrive in the Arctic – a central part of their living legacy and history.

2.3 Using Google Earth as a TK mapping tool

Information Technology can assist Indigenous communities in accessing, interpreting, and understanding their archaeological history and cultural heritage. Low-cost photogrammetry enabled Inuvialuit community members to participate more directly in the interpretation of archaeological material from Banks Island (Haukaas & Hodgetts, 2016). Virtual reality enabled Inuit Elders to experience a sod house in ways that would not be possible through a static museum display (Dawson et al., 2011).

Any digital tool for documenting Inuvialuit TK must be capable of capturing its complex, multi-faceted nature and highlighting nuanced variations within it. Google Earth is a popular interactive digital mapping software tool that allows users to navigate a map through a computer or mobile device and to display various types of audio, visual, and other interactive forms of digital content about specific locations. Google Earth has been used successfully to digitize archaeological and heritage information in places such as Stonehenge and Easter Island (Welham et al., 2015, Torres Hochstetter et al., 2011). Using Google Earth in similar ways, I propose that it should be possible to construct a map of various traditional places, place names, activities and other cultural information. Such a map could potentially facilitate greater access for Inuvialuit to these TK resources through the internet that might be otherwise physically impossible. The technology of the map may also appeal to Inuvialuit youth and therefore serve as a means of sharing TK across generations in the digital realm.

However, the use of technology can also create challenges for Indigenous communities. The proliferation of internet technologies has created new opportunities and ethical considerations concerning online access to cultural information. Digital representations of artifacts and archaeological heritage objects can sometimes be more accessible to local communities, particularly in cases where museums or other curation facilities that are

located far away. For example, the Māori people have successfully exploited digital technologies not only to record and archive their “taonga” (traditional knowledge) but also to strengthen and extend connections within and across communities between people and particular heritage objects and places (Ngata et al., 2012). However, the use of technology can also further perpetuate colonial power inequalities that have historically existed between Western “specialists” and Indigenous peoples in situations where local communities do not have the requisite IT skills or capacity to manage technical heritage solutions (Haukaas & Hodgetts, 2016). Some remote communities, particularly in the Arctic, may have limited access to computers, internet bandwidth, and high-speed information communications technology infrastructure (ICT) (Dawson & Levy, 2016). At the same time, the open accessibility of the internet might create new concerns for Indigenous communities relative to their intellectual property rights and the ability to control access to sensitive cultural information such as burial sites or sacred artifacts (Brown & Nicholas, 2012). The digital recreation of cultural heritage can also enable digital heritage resources to be more easily misappropriated or commodified as part of a public internet discourse relating to vanishing cultures (Brown & Nicholas, 2012).

The research and conclusions in this paper are based upon community engagement during my fieldwork in the ISR in 2018. I will first demonstrate how a Google Earth-based interactive digital map can approximate some key aspects of Inuvialuit Traditional Knowledge and can therefore be useful for documentation and sharing their cultural heritage. I will then highlight some key priorities, implementation challenges, and other considerations that will need to be addressed through the design and final implementation of the map, before concluding with observations about the relevance of the map to the Inuvialuit community moving forward.

2.4 Research Methodology

Successful community-based archaeology projects seek to center their activities around the unique needs and objectives of the Indigenous communities with whom they partner. This research adheres to that principle as part of the Inuvialuit Living History project.

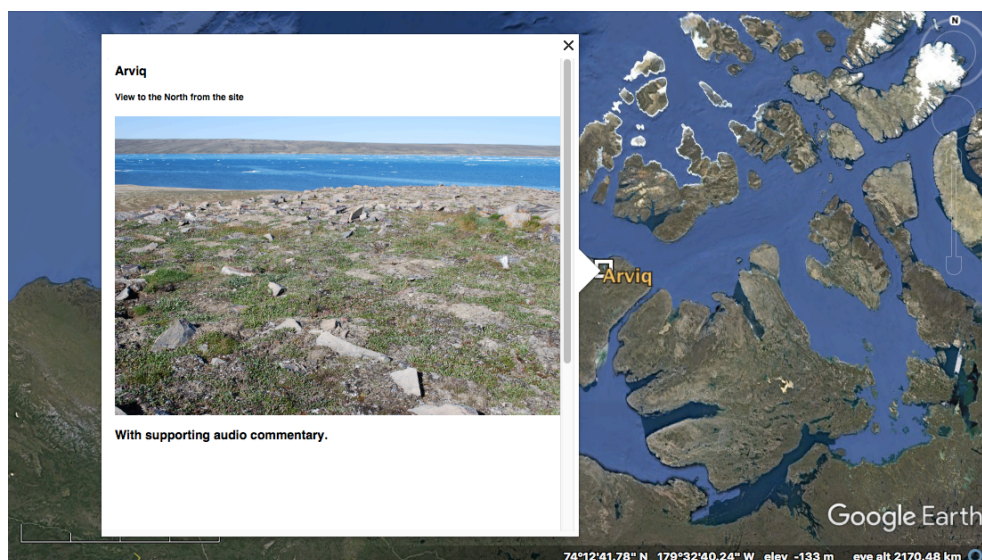
In order to assess the effectiveness of an interactive digital map as a means of documenting and sharing Inuvialuit cultural heritage, I needed to solicit input from a cross-section of perspectives from Inuvialuit Elders, adults, and youth about the purpose, potential structure, and accessibility of such a map. I undertook the following process of community engagement to allow Inuvialuit to experience a range of potential approaches to the design of the map.

1. My first step was to select an appropriate software platform to use for the project. I considered several digital mapping solutions including World Wind, ArcGIS, and Google Earth. These solutions capture, store, manipulate, analyze, manage, and spatially present geographic data. I decided to use Google Earth for this project because it has been used successfully in other archaeological projects and because it is free and widely used in the public realm.
2. My next step was to develop an initial prototype of an interactive digital map using Google Earth (see Figure 2) that could be used to engage people in discussing a spectrum of possibilities for how a digital map might be designed to address their needs. I used the prototype to demonstrate the basic functionality of digital maps for those that might be unfamiliar with them. It also allowed me to introduce a range of possible ways to digitally represent traditional activities, places, and stories.

I developed the initial version of the prototype based on 6 sample archaeological and cultural sites from across the ISR. I used Google's Key Hole Markup (KML) language to link different arrangements of multi-sensory digital content to each of these locations to exemplify a range of potential user interactions. Sample sites exhibiting lower user interaction levels contained photographs with basic audio and text clips, while other more sophisticated site examples featured YouTube video clips, 360 photospheres with adjustable camera views and interactive 3D models.

Table 1: Prototype Map sample site content design

Site 1	Basic photographs of artifacts with supplemental descriptive text
Site 2	A Youtube video of cultural activity (Drum dancing) with supplemental descriptive text.
Site 3	Basic photographs of an archaeological site with background audio
Site 4	An interactive Photosphere of an archaeological site with movable camera angles
Site 5	An interactive 3D model (of a Thule sod house floor)
Site 6	A Drone fly-through over the geography of the ISR with supplemental descriptive text

**Figure 4: Sample archaeological site (Arviq) with Photo and background Audio**

3. My last step was to engage the Inuvialuit community in discussions about the map using a University approved Ethics protocol that was supported by an NWT Scientific Research License approved by the Aurora Research Institute (<http://nwtresearch.com/>). During the summer of 2018, I engaged a variety of Inuvialuit Elders and adult community members in these discussions. The Great Northern Arts Festival is held annually in Inuvik, Northwest Territories. I displayed my prototype map at an information booth about the ILH project during the festival, which created numerous opportunities for me to engage Inuvialuit community members and members of the general public in informal discussions about archaeology, cultural heritage, and digital mapping. During this timeframe, I also arranged several formal interviews with Elders and other traditional knowledge holders in Inuvik and Tuktoyaktuk to discuss the purpose, design, and content of the interactive map. In late September, the ILH project organized a community gathering in Inuvik that brought together Inuvialuit Elders and school students, to engage in cultural activities and explore Inuvialuit artifacts from Prince of Wales Northern Heritage Centre and Parks Canada. During this gathering, I engaged in many informal discussions about the map with students. Around the same time, I also led classroom workshops involving digital mapping with high school students in Inuvik and Tuktoyaktuk.

2.5 Inuvialuit Community feedback on map design and use

I found the prototype map to be consistently interesting to all age groups throughout the engagement process within the Inuvialuit community. One of my most important observations was that the map seemed to elicit stories from people about their memories and experiences in different places as they interacted with it. One Inuvialuk Elder at the Great Northern Arts Festival, despite his lack of familiarity with either a computer or Google Earth, sat beside me for almost an hour during which time I navigated to various places on the map for him and he shared their significance with me. As he pointed out specific locations on the map, they triggered memories which he recounted in the form of personalized stories about the past and his life. In another case, Elder Albert Elias used the map to show me key locations and travel routes from his boyhood traveling the

coastal waterways with his father on their family schooner *The Fox*. In one story, he recalled how they had been forced to travel by dogsled from Banks Island across the dangerous sea ice to the mainland near Baillie Island in order to retrieve supplies during a particularly bad winter in 1934-1935. Embedded in his story was an example of his traditional knowledge -- how Inuvialuit sometimes navigated their way using tongue drifts in the snow as directional markers for the prevailing winds. Students also engaged quickly and easily with the map. During the community gathering at the East Three Secondary School in Inuvik, many students showed a particular interest in adding the locations of their family camps to the map. By adding their own named placemarks, they were able to engage with the map on a more personal level. These initial observations are important because they highlight the capacity that maps in general, and digital maps in particular, can have for Inuvialuit -- the capacity to engage their interest, to reconnect places with personal experiences, and to elicit memories and stories about those places.

2.5.1 Specific priorities for map content

Several community members indicated to me that traditional place names should be incorporated into the map. For many Inuvialuit Elders, traditional place names help them to remember and exchange information with each other about navigation details, resource potential, and other historical details related to particular places on the land (Lyons et al., 2010). Lawrence Amos (Inuvialuit Knowledge Holder) explained that traditional Inuvialuktun places were often named in particular ways to reflect their significance to life on the land. He also noted that many older names for places had been lost “*because young people tend only to use modern names now.*” Albert Elias suggested that these underlying meanings for traditional places could be useful additions to the map to help modern Inuvialuit youth understand the rationale for past travel routes and destinations, which may not otherwise be evident to them. His wife, Shirley Elias, added that the use of traditional place names would not only contribute to their retention but that the map might also be used as a catalyst to assign new names to significant unnamed places.

Community members also repeatedly emphasized the need to incorporate traditional Inuvialuktun language content into the map. Three distinct dialects of Inuvialuktun are spoken in the Inuvialuit Settlement Region. Sallirmiutun (formerly Siglitun) is spoken

primarily along the coast in communities such as Tuktoyaktuk. Ummarmiutun is spoken in inland communities like Aklavik. Kangiryuarmiutun is used in the community of Ulukhaktok on Victoria Island, and also in Sachs Harbour on Banks Island, where Sallirmiutun is also spoken (Inuvialuit Regional Corporation, n.d.). Unfortunately, all of these dialects are recognized as severely endangered because they are only known to a shrinking number of Elders and traditional language specialists (Inuvialuit Regional Corporation, n.d, Moseley, 2010). Darrel Nasogaluak also linked the loss of traditional language to the impact of residential schools that “*destroyed our language*” as part of their lasting legacy. He and several other Elders feel that it is important to find ways to continue to use the language, both to keep it alive and to reinforce people’s connections with the land and their traditional ways of life. Darrel explained: “*when our daughter sees something, she remembers it first in our language*” because of their focus on traditional language at home. Using Inuvialuktun also helps to avoid the loss of cultural meaning that can sometimes occur in the translation from Inuvialuktun to English (Nagy, 2002). The Inuvialuit Cultural Centre has undertaken a series of language-related initiatives to help stem this critical loss of their language. Some examples of their efforts include the translation, digital reproduction, and archiving of past conversations with Elders into a digital library of traditional language recordings. This library could potentially serve as a traditional language information source for the interactive map. Darrel offered an interesting suggestion for the design of the map – to consider organizing content around traditional language dialect. Such a novel approach might help to promote the ongoing significance of traditional language in the present. However, it could be difficult to decide which dialect to use in any given region, since their ranges often overlap and have doubtless changed through time.

Succinct and descriptive Inuvialuktun audio clips could be embedded within particular placemarks on the map using Google Earth KML code. These placemarks could be organized into particular groupings by geographic region or language dialect. Traditional place names could likewise be added, including additional details about the traditional significance or meanings of these names.

2.5.2 Potential for use as a storytelling platform

Another way the map can be used to capture the diversity of traditional knowledge and personal experience is in the digital recording of stories. During the community gathering at East Three Secondary School the prototype map became a focus for a conversation between Elder Nellie Arey and Inuvialuit Living History co-director Natasha Lyons. With little prompting, Nellie quickly embraced the map and began to use it as a reference point and catalyst for further storytelling (Figure 5). She began by pointing out the specific locations of various camps that she had visited as a young girl with her *Daduk* (grandfather) and continued to provide details about the purpose of each camp and the time of year that each was used. Nellie then went on to describe her more recent trips to these camps and some of the changes that she had observed over time. By using the interactive capabilities of Google Earth in real-time, I was able to quickly incorporate each of these locations into the prototype map as Nellie was talking about them, along with some of the information she shared about these places and their significance in her life. David Stewart of the Inuvialuit Communications Society produced a short descriptive video (<https://www.youtube.com/watch?v=g2KauK1njin0>) which demonstrates how the map could be used to document traditional knowledge, stories, and life histories.



Figure 5: Nellie Arey using the map to share stories with Dr. Natasha Lyons

Using Google Earth Tour Builder (Beta) or KML code, these short audio-video narratives can be used to create digital story maps that can be shared with Inuvialuit youth and others to give them a sense of what traditional life was like on the land in the past. Current and historical photographs of particular places can also be combined with detailed quotations to reflect changes due to environmental factors and other technological improvements. Alternatively, drone flyovers and 360° panoramic photospheres could be used in conjunction with short video clips containing personalized descriptions about where, how, and why traditional activities were done in these places. When used in this way, the map can serve three critical functions. In addition to acting as a catalyst for story-telling, it can also provide a tool for documenting stories in their appropriate geographic context, and can serve as an accessible archive of stories, photos, video, text and other content related to Inuvialuit history. The map could also enable individuals in remote ISR communities to digitally access traditional knowledge and other information about artifacts that have been curated in faraway places such as the Smithsonian Institute or the Prince of Wales Northern Heritage Centre.

2.6 Incorporating TK content into Google Earth

Google Earth can be effective in documenting some aspects of traditional knowledge by displaying a variety of digital representations of places, activities, and stories across any geographic area. These depictions can help to convey the individual nuances and other regional variations that exist within Inuvialuit TK. Google Earth also has the benefit of allowing map content to be added over time as new information and traditional knowledge is acquired.

It is challenging to design and incorporate digital content into a single map such that it can be easily accessed without being overwhelming or inadvertently reducing the diversity of any particular Inuvialuit traditional practice to a specific set of digital images or representations. Elder Albert Elias also acknowledged that the construction of such a map could generate some questions and disagreements within different communities related to decisions about what information should be incorporated.

Google Earth offers a technical means to assist with managing these different content dimensions. Google Earth “layers” can be used to organize map content by particular properties relating to geography or other defining characteristics for display purposes. Standard features like borders, roads, oceans, and official place names can be either excluded or included from a particular map region using layers. Layers can also be customized to incorporate more specific ways of organizing and filtering map content into accessible information subsets for users of the map. Community members offered several potential strategies for utilizing layers to organize map content during the interviews, including geography, historical timeframe, and language dialect. Because of Inuvialuit emphasis on being out on the land, the majority of respondents indicated that the map layers should be oriented around geographic regions and markers. For example, a “Banks Island Archaeology” layer could be used to distinguish multiple archaeological sites from Banks Island with particular color and placemark typology as shown in Figure 6 below.



Figure 6: Banks Island Archaeology Layer

Layers could also be used to display aspects of similarity and difference in a particular traditional practice or artifact. For example, a layer could be created to display the regional and technological variations in traditional Inuvialuit sled construction patterns over time. Within such a layer, different placemark symbols could be used to highlight the evolution of the source materials used for sled construction from driftwood to planked timber.

Layers allow map users to control the amount of information that is displayed within the map at any given time depending upon the focus of their interest. Through the creative use of layers, it should be possible to incorporate large amounts of information into a single map in a robust but accessible way.

While Google Earth can be effective in representing and conveying Inuvialuit TK in these ways, there may be some aspects of Inuvialuit TK that do not lend themselves easily to being represented on a digital map. For example, it may not be feasible to convey Inuvialuit spiritual beliefs about a particular place or an individuals' personal connection to a sacred object using digital media within the map.

2.7 Managing online access to sensitive information

While there are numerous benefits to documenting cultural information online, several Inuvialuit respondents also expressed concerns about the potential for loss of control over sensitive traditional knowledge once it is publicly available on the internet. Some participants felt that making the specific geographic coordinates of fragile archaeological sites available to the general public would be a mistake because, as one Elder stated: *“once you put it on a map, people will come.”* Sharing information about site location online could, for example, facilitate looting at those sites (Zimmerman et al., 2003). Several Inuvialuit cited gravesites as examples of sensitive cultural information. They were taught by their parents and Elders to respect gravesites, whether marked or unmarked, as sacred places where artifacts and bones were not to be disturbed or touched. One Elder indicated that Inuvialuit believe in spirits and it is vital to *“make peace with the past, acknowledge and respect the people who came before because the spirits of the dead can be dangerous.”* James Pokiak further explained that he was taught never to take anything (utensils, tools, etc.) from gravesites because the people who died there would need to have access to their hunting and sewing tools in the after-life. Despite these widely held sensitivities, there was no clear consensus on the question of whether gravesite locations should be incorporated into the map or not. Everyone that I spoke to believed that special care should be taken to protect these sites. However, some people felt that the locations of gravesites should be included on the map as a sign of respect for the dead, while others opposed doing so for the same reason. Some Elders felt that it was important to enable Inuvialuit youth to know where their ancestors may have been buried, while others felt that it would be better for youth to discover this information through their exploration of the land. Mervin Joe (Inuvialuit traditional knowledge holder) highlighted another complexity— that the ancestry of individuals in gravesites is often difficult to ascertain and that consultation with neighboring Indigenous communities such as the Gwich’in should be done before the location and any other information about any gravesites is published. He also shared that he had been told by his Aunties and Uncles about certain gravesites and questioned: *“is it my responsibility to tell others about these places - is it any of their business?”* Ultimately the decision about whether to include information about sensitive or sacred sites on the map must rest with the Inuvialuit

community. One strategy would be to avoid including any detailed information about these types of sites on the initial public version of the map. Another possibility would be to incorporate only the general locations of some gravesites on the map, but without specific geographic coordinates. This could be accomplished by using oversized placemarks or polygons which cover a general area rather than a specific location, or by incorporating a random offset into the geographic coordinates used in displaying such sites on the Google Earth map. In these ways, the fact that there are gravesites in a particular area could still be conveyed to a user of the map, but their exact locations would remain obfuscated.

This discussion about gravesites highlights a broader set of privacy and ethical issues that relate to online access to cultural information that will need to be carefully considered in the implementation of the map. A supplemental set of policies and procedures should be defined for the map, which outline the criteria and display protocols for sensitive cultural information. Through these protocols, Inuvialuit will have the capacity to designate whether and how their traditional knowledge is shared beyond their community. These controls could help to prevent gravesites from being looted and other digital representations of sensitive artefacts from being reproduced and commodified (Hollowell, 2003; Zimmerman et al., 2003). This work could build upon existing research completed by the Intellectual Property Issues in Cultural Heritage (IPinCH) project (<https://www.sfu.ca/ipinch/>) on Traditional Knowledge labeling in local contexts (<http://localcontexts.org/tk-labels/>) (Anderson & Christen, 2013). Within this framework, there are examples of digital TK labels that include categorization and handling protocols for sensitive and sacred cultural information that could be modified and applied to this mapping project in the ISR.

There are also technical decisions that will need to be made concerning the control of sensitive information within the map. One way to restrict access to sensitive information within the map would be to require a password to access portions of the map. Password protection would require additional software coding during the initial implementation of the map on the ILH website, and a process for monitoring and granting requests for access. The Reciprocal Research Network (<https://www.rrncommunity.org/>) is an example of a password controlled environment that is designed to enable a specific

network of people to have online access to archaeological and heritage collections that are held in a variety of curation facilities around the world. The ILH website currently draws its information about artifacts featured on the site from the RRN and users wanting to explore those records in more detail can request access to the RRN. We could explore the possibility of including site records in the RRN as well and having map placemarks link to records within the RRN that only Inuvialuit could access. An alternative strategy to control access to sensitive information would be to construct two separate versions of the map; a public version containing no sensitive information, and an internal version that would only be available in select locations such as the Inuvialuit Cultural Centre. Maintaining these two versions would remove the challenges of implementing and managing password access across the ISR, but it could create other issues in terms of policing access to computers in public facilities, such as the ICC, that also welcome non-Inuvialuit visitors. Another lessor factor to consider is that some duplication of effort will be involved in managing two versions of the map rather than one. In the interests of minimizing technical complexity for initial implementation, the ILH project should focus first on developing a static public version of the map for display on the ILH website. Following its deployment, the focus can shift to developing a separate private version of the map that contains sensitive cultural content. The private version could initially be made available at the ICC in order to test protocols for controlling access and evaluating more sophisticated password control solutions to the map.

It is also essential to consider the data privacy terms and conditions for any sensitive information that might be stored in Google Earth or any other internet-based mapping software solution. Google, as a large US company with a multi-national presence, has a comprehensive set of data usage and information privacy terms and conditions (https://www.google.com/help/terms_maps/). These terms include general protocols for managing user-generated photo and video content, as well as other more specific protocols that would apply to sensitive map content that might be configured for example to be accessible only from one particular local computer at the ICC.

2.8 Internet access in the Inuvialuit Settlement Region

The availability, consistency, and robustness of Information communications technology (ICT) infrastructure across the ISR will correlate directly with the usability of the map from a user perspective. The Canadian Government has formulated a digital strategy (2018) to increase high-speed broadband coverage for all Canadians including those in remote, rural and northern parts of the country. However, many Northern communities face challenges with limited computer and high-speed internet access (Dawson et al., 2016). There are notable differences in internet technologies across the communities of the ISR, based on information from the last Statistics Canada census (Figure 7).

ICT	All Households No. (%)	With Home Internet Access						Without Home Internet Access	
		Total No. (%)	With Wireless No. (%)	Without Wireless No. (%)	Without Wireless No. (%)	Without Wireless No. (%)	Without Wireless No. (%)	No. (%)	No. (%)
Northwest Territories	14,730 100.0	11,659 79.2	10,229 69.4	1,430 9.7				2,991 20.3	
Inuvialuit Settlement Region	2,043 100	1,497 65.5	1,270 49.5	227 16.0				531 34.0	
Aklavik	Cable/DSL/4G 226 100.0	119 52.7	87 38.5	32 14.2				106 46.9	
Inuvik	Fiber Optic/4G 1,279 100.0	1,069 83.6	978 76.5	91 7.1				198 15.5	
Paulatuk	Cable/DSL/4G 89 100.0	62 69.7	40 44.9	22 24.7				26 29.2	
Sachs Harbour	4G Cellular 40 100.0	33 82.5	27 67.5	6 15.0				7 17.5	
Tuktoyaktuk	Cable/DSL/4G 265 100.0	139 52.5	83 31.3	56 21.1				125 47.2	
Ulukhaktok	4G Cellular 144 100.0	75 52.1	55 38.2	20 13.9				69 47.9	

Sources: NWT Bureau of Statistics, 2014 NWT Community Survey, Northwestel Modernization Plan 2015

Figure 7: Internet connectivity by Community in the ISR

Fiber-optic cable has been installed along the Dempster highway which has made high-speed internet access available in Inuvik. However, internet access for other mainland communities such as Aklavik and Paulatuk continues to rely on slower DSL (i.e. “dial-up”) connection technologies, while other more isolated communities such as Sachs Harbour on Banks Island and Ulukhaktok on Victoria Island depend on satellite internet connections.

These ICT infrastructure differences are critical factors to consider in the technical design of the map because they will directly impact the usability of the map. Internet access and bandwidth limitations might make it difficult to incorporate certain types of digital content into the map. Simple text and photographs require less bandwidth than video,

360 photospheres, and 3D models, which involve larger digital file sizes. An interactive 3D model that loads in seconds in Inuvik could take hours to load in Sachs Harbour, making the map unworkable in the latter community. Ideally, the digital map should be accessible to all members of the ISR community regardless of where they live. One approach to work around these bandwidth limitations would be to utilize only low bandwidth text, audio, and video file digital content in the map. By using these simpler file structures, the amount of bandwidth required for the map to correctly display can be aligned with the minimum standard of internet access capacity in the ISR. An alternative strategy would be to develop a localized version of the map that could be deployed to kiosk style or particular purpose computers without internet access in those communities with less ICT capacity such as Schools, or Public Libraries. This standalone version of the map would utilize local caching functions within Google Earth to store basic map content on the hard drive of a local computer. While this strategy would mitigate the reliance of the map on the internet to function, it would also add new logistical challenges to produce, distribute, and implement local copies of the map at targeted locations across the ISR. It may also be technically impractical to incorporate interactive 3D models and other forms of complex digital content into these localized maps because of storage and caching capacity limitations of the local computers. In order to minimize technical and logistical complexity, the easiest way for the project to deal with the bandwidth restrictions is to utilize only low bandwidth-intensive digital resources in the initial deployment of the map. As ICT infrastructure improvements continue to occur in the ISR, more sophisticated forms of digital content can subsequently be incorporated into future iterations of the map.

Beyond the initial implementation of the map, it may also be possible to work with the Inuvialuit Cultural Centre and the local high schools to develop co-operative education opportunities for local students to develop HTML, security, and Google Earth KML development skills that would enable more technically sophisticated versions of the map to be supported in the future.

2.9 Conclusions

This research demonstrates that a Google Earth-based map aligns with key aspects of traditional knowledge by associating traditional activities within their particular geographic context in ways that resemble the “mental maps” that Inuvialuit use to conceptualize this information. Inuvialuit oral tradition is based on storytelling, and Google Earth can be used to convey individual map biographies and other stories that reflect both similarities and differences in Inuvialuit traditional culture. An interactive digital map can, therefore, serve as a means to document and share Inuvialuit traditional knowledge in ways that uniquely appeal to Inuvialuit sensibilities and to Inuvialuit youth in particular. However, digital mapping should never be perceived to be equivalent to oral tradition. A digital map can never replace the type of personalized wisdom that Elders possess, but it can serve the community well as a repository for stories and other components of traditional knowledge, making them widely accessible online. The decision to use a digital map for this purpose is similar to many other technological advances made or adopted by Inuvialuit over time. It is a conscious choice that comes with many benefits, and also introduces some new challenges and considerations related to internet bandwidth limitations, managing access to sensitive cultural information, and ensuring that the map appropriately reflects the variability and richness of Inuvialuit traditional knowledge across the ISR.

Through a creative effort to design and deploy an interactive Google Earth map, the Inuvialuit Living History project can positively contribute to the community objectives to document and share Inuvialuit traditional knowledge. Such a map will enable Inuvialuit to virtually visit archaeological sites that may not be otherwise accessible to them and to access Inuvialuit and archaeological knowledge about those sites in ways that closely resemble their traditional ways of knowing the world. The map would also enable other interested Canadians to learn about Inuvialuit traditions and history.

2.10 References

- Anderson, J., & Christen, K. (2013). Chuck a copyright on it: Dilemmas of digital return and the possibilities for traditional knowledge licenses and labels. *Museum Anthropology Review*, 7(1–2), 105–126.
- Atalay, S. (2008). Multivocality and Indigenous Archaeologies Beyond Nationalist: Global Applicability of Indigenous Archaeologies. In M. J. M. Habu J., Fawcett C. (Ed.), *Evaluating Multiple Narratives*. Springer, New York, NY. 29-44.
- Bielawski, E. (1989). Dual Perceptions of the Past: Archaeology and Inuit Culture. In *Conflict in the Archaeology of Living Traditions*, R. Layton, ed. Pp. 228-236. London: Unwin Hyman.
- Briggs, J. (1992). Lines, Cycles and Transformations: Temporal Perspectives on Inuit Action. In *Contemporary Futures: Perspectives from Social Anthropology*, edited by Sandra Wallman, pp.83-108. London: Routledge.
- Brown, D., & Nicholas, G. (2012). Protecting Indigenous cultural property in the age of digital democracy: Institutional and communal responses to Canadian First Nations and Māori heritage concerns. *Journal of Material Culture*, 17(3), 307–324.
- Collignon, B., Weber Müller-Wille, L., & Canadian Circumpolar Institute. (2006). *Knowing places: The inuinnait, landscapes, and the environment*. Edmonton, AB: Canadian Circumpolar Institute (CCI) Press.
- Dawson, P., & Levy, R. (2016). From Science to Survival: Using Virtual Exhibits to Communicate the Significance of Polar Heritage Sites in the Canadian Arctic. *Open Archaeology*, 2, 209–231.
- Eades, G. L. (2015). Meme maps. (pp. 164) MQUP.
- Gill, A. A. (2009). Digitizing the Past: Charting New Courses in the Modeling of Virtual Landscapes. *Visual Resources*, 25(4), 313–332.
- Gilster, P. (1997). *Digital literacy*. New York: Wiley Computer Pub.
- Government of Canada. *Digital Canada 150*. Retrieved from: <https://www.ic.gc.ca/eic/site/028.nsf/eng/00591.html> (access May 1, 2019).
- Haukaas, C., & Hodgetts, L.M. (2016). The Untapped Potential of Low-Cost Photogrammetry in Community-Based Archaeology: A Case Study From Banks Island, Arctic Canada. *Journal of Community Archaeology & Heritage*, 3(1), 40–56.
- Hollowell, J. J. (2004). “Old things” on the loose*: *The legal market for archaeological materials from alaska's bering strait* (Order No. 3133876). Available from ProQuest

Dissertations & Theses Global. (305201260). Retrieved from <https://www-lib-uwo-ca.proxy1.lib.uwo.ca/cgi-bin/ezpauthn.cgi?url=http://search.proquest.com.proxy1.lib.uwo.ca/docview/305201260?accountid=15115>

Torres Hochstetter, F., Haoa, S. R., Lipo, C. P., & Hunt, T. L. (2011). A Public Database of Archaeological Resources on Easter Island (Rapa Nui) using Google Earth. *Latin American Antiquity*, 22(3), 385–397.

Ingold, T. (2004). Culture on the ground: The world perceived through the feet. *Journal of Material Culture*, 9(3), 315-340.

Inuvialuit Settlement Region Traditional and Local Knowledge catalogue. (n.d.). Retrieved from: <http://isrtlk.com/> (accessed May 1, 2019).

Inuvialuit Regional Corporation. (n.d.). Retrieved from: <https://www.irc.inuvialuit.com/> (accessed May 1, 2019).

Lyons, N., Dawson, P., Walls, M., Uluadluak, D., Angalik, L., Kalluak, M., ... Suluk, L. (2010). Person, place, memory, thing: How inuit Elders are informing archaeological practice in the Canadian north. *Canadian Journal of Archaeology*, 34(1), 1-31.

Lyons, N. (2010). The Wisdom of Elders: Inuvialuit social memories of continuity and change in the 20th century. *Arctic Anthropology* 47(1): 22-38.

Lyons, N. (2013). Where the wind blows us: Practicing critical community archaeology in the Canadian north. Tucson: University of Arizona Press.

Lyons, N., Schaepe, D. M., Hennessy, K., Blake, M., Pennier, C., Welch, J. R., ... Pennier, C. (2016). Sharing deep history as digital knowledge: An ontology of the Sq'ewlets website project. *Journal of Social Archaeology*, 16(3), 359–384.

Kelvin, L. (2016). There Is More Than One Way to Do Something Right: Applying Community-Based Approaches to an Archaeology of Banks Island, NWT. *Electronic Thesis and Dissertation Repository*. 4168. <https://ir.lib.uwo.ca/etd/4168>

Moseley, C. (ed.). (2010). Atlas of the World's Languages in Danger, 3rd ed. Paris, UNESCO Publishing. Online version: <http://www.unesco.org/culture/en/endangeredlanguages/atlas> (accessed May 1, 2019).

Nagy, M. (2002). Comment les inuvialuit parlent de leur passé: Note de recherche. *Anthropologie Et Sociétés*, 26(2-3), 193-213.

Ngata, W., Ngata-Gibson, H. and Salmond, A. (2012). Te Ataakura: Digital *Taonga* and Cultural Innovation. *Journal of Material Culture*, 17(3), 229-244.

Nuttall, M. (1992). *Arctic homeland: Kinship, community and development in Northwest greenland*. Toronto: University of Toronto Press.

NWT Bureau of Statistics. (2016). *Home Internet Access by Community (2009 to 2014)*. Retrieved from: https://www.statsnwt.ca/Housing/internet_usage.html (accessed May 1, 2019).

Statistics Canada (2017). *The internet and digital technology*. Retrieved from: <https://www.statcan.gc.ca/pub/11-627-m/11-627-m2017032-eng.htm> (accessed May 1, 2019).

Stewart, A.M., Keith, D., & Scottie, J., (2004). Caribou Crossings and Cultural Meanings: Placing Traditional Knowledge and Archaeology in Context in an Inuit Landscape. *Journal of Archaeological Method and Theory*, 11(2): 183-211.

Torres Hochstetter, F., Haoa, S. R., Lipo, C. P., & Hunt, T. L. (2011). A Public Database of Archaeological Resources on Easter Island (Rapa Nui) using Google Earth. *Latin American Antiquity*, 22(3), 385–397.

Welham, K. et al. (2015). Google Under-the-Earth: Seeing Beneath Stonehenge using Google Earth - a Tool for Public Engagement and the Dissemination of Archaeological Data. *Internet Archaeology*, 40.

Zimmerman, L. J., Vitelli, K. D., & Hollowell, J. J. (2003). *Ethical issues in archaeology*. Walnut Creek, CA;Oxford;: Altamira Press in cooperation with the Society for American Archaeology.

Chapter 3

3 Traditional Inuvialuit pedagogy using Google Earth

3.1 Introduction

Community-based archaeology projects seek to engage Indigenous or other communities more directly in the interpretation of their archaeological past, thereby helping archaeology to “decolonize” itself from the Euro-centric viewpoints that previously dominated the discipline (Atalay, 2006). Indigenous communities have historically used their own ways to remember and share traditional knowledge (Atalay, 2006). In intersecting Indigenous traditional knowledge with Western scientific analysis, community-based archaeology can create more meaningful, equitable approaches to sharing Indigenous traditional knowledge and cultural heritage within and beyond Indigenous communities (Atalay, 2008). However, the transfer of Indigenous traditional knowledge often involves protocols and processes that vary and evolve considerably from one Indigenous community to another, with the advent of new technologies (Kelvin 2016; Berkes, 2009). Given the diversity of Indigenous communities and contexts, it is crucial to develop approaches to sharing traditional knowledge that are culturally appropriate for a given group.

The Inuvialuit are the Inuit people of the western Canadian Arctic. The Inuvialuit Settlement Region (ISR) in the Northwest Territories and Yukon was defined under the Inuvialuit Final Agreement, the land claim agreement signed by the Inuvialuit and the Government of Canada in 1984.

The Inuvialuit Living History (ILH) project is a community-based initiative that seeks to create new digital ways of assisting Inuvialuit with the documentation and intergenerational sharing of their history and cultural heritage. The Inuvialuit Cultural Centre (ICC) is one of the principal partners in the project. Their main priority is sharing Inuvialuit knowledge, including the revitalization of traditional language and skills.

Information technology has been successfully used to assist Indigenous communities with the digital documentation and interpretation of their past (Dawson et al., 2011; Haukaas

& Hodgetts, 2016; Ngata et al., 2012). Community-based efforts such as the Sq'ewlets website project (<http://digitalsqewlets.ca/>) have been particularly useful in capturing the interest of Indigenous youth through the internet and social media channels (Lyons et al., 2016). The Kitikmeot Heritage Society, a community organization in Cambridge Bay, Nunavut, has developed a series of digital atlases and online collaboration tools to assist with the preservation and transmission of Inuit traditional knowledge (Kitikmeot Heritage Society, n.d.). Through such interactive digital mapping tools, it is possible to document cultural activities and personal experiences within the specific geographic context in which they occurred (Taylor & Lauriault, 2014).

Inuvialuit teaching and learning is based on listening, observation, and direct personal experience. An interactive digital map of Inuvialuit Cultural Heritage has the potential to engage Inuvialuit youth in the intergenerational transfer of traditional knowledge through an appealing digital interface that allows them to observe and hear stories about traditional places and activities in ways that parallel those specific aspects of traditional Inuvialuit learning behaviors.

3.2 Traditional Inuvialuit Teaching and learning

For many Indigenous communities, including the Inuvialuit, traditional knowledge (TK) is acquired through their daily life experiences - traveling, gathering, hunting, fishing, making tools and clothing on the land (Kelvin, 2016). Inuvialuit TK encompasses a variety of skills, technical information, spiritual beliefs, and other personal experiences related to hunting, fishing, and trapping (cf. Bonesteel, 2006; Friesen and Friesen, 2005, Stewart et al., 2004). TK can also include knowledge about sewing, tool making, land management, spirituality, games, legends and historical events (Bonesteel, 2006; Friesen and Friesen, 2005, Stewart et al., 2004). Inuvialuk Elder James Pokiak described his learning experiences in this way “*Living, hunting, and fishing on the land – that was my University*”. Inuvialuit language specialist, Beverly Amos added that Inuvialuit internalize this information in the form of complex “*mental maps*” that they carry in their heads. Inuvialuit use these mental maps to conceptualize their current geographic circumstances with the seasonal context, the availability of food, shelter, and other

resources, and their recollection of past experiences or events that may have happened there.

Traditional education is facilitated by older family members based on their personal life experiences and knowledge that has been passed down to them by previous generations (Bonesteel & Anderson, 2008; Friesen & Friesen, 2005). Inuvialuit youth learn through observation, listening and their own experience. Traditional education often occurs through storytelling in the process of performing routine tasks in particular places or circumstances (Taylor & Lauriault, 2014). By sharing stories and their personal experiences, Elders and other traditional knowledge holders can explain how and why particular traditional activities were done and demonstrate respect for the skills of their ancestors (Lyons, 2013). Inuvialuit youth are taught first to watch and listen to their Elders before internalizing this information through direct hands-on experience. By performing these traditional daily tasks, they can hone their skills, while also sustaining unique connections with the land and their ancestors in ways that cannot be acquired through oral communication alone (Kelvin, 2016).

Oral tradition clearly plays a vital role in the process of transferring this information from one generation to another through storytelling. However, several Elders and other adult community members emphasized that Inuvialuit learning involves a combination of passive and active modes of engagement. One Inuvialuk traditional knowledge holder described the process to me in this way *“Inuvialuit youth are taught not to interrupt Elders, to learn by watching and listening, before doing ... teaching is doing by example, not by instruction.”* Elder Albert Elias conveyed that he watched and listened closely to his Dad, but that he learned mainly by doing, rather than being taught. Learners are expected to watch and listen quietly, but with a curious mind and ultimately the willingness to actively engage in the task themselves. Elders, on the other hand, must be willing to share their knowledge, but also to allow learners to explore and learn through their own experiences and mistakes.

Historically, traditional Inuvialuit approaches to teaching and learning were severely challenged and undermined by a variety of social, environmental, and political factors

(Taylor & Lauriault, 2014; Kelvin 2016). Many of these factors are the result of colonial processes. The transition to a wage-based economy has reduced the ability of many Inuvialuit to go out on the land for traditional subsistence purposes. Climate change has altered sea ice patterns and the migration patterns of some animal and marine wildlife, which in turn has impacted traditional strategies for hunting and fishing. Time spent in residential schools has also deprived many Inuvialuit of traditional learning opportunities. Elder Albert Elias explained that he lost three years of learning experience compared to others in his community who did not go away to residential school.

Due in part to these changes and because of their desire to learn and incorporate new technologies into their pedagogies, the community is investigating new ways to document and share their cultural heritage within the Inuvialuit community and with youth in particular to engage them in learning traditional skills and knowledge. Many Inuvialuit Elders, such as Shirley Elias, feel a responsibility to pass on their knowledge and life experiences to young people who may not otherwise be able to know about or benefit from the past. Other Elders, such as James Pokiak, are concerned that “*younger people don’t go out [on the land] any more*” and therefore do not have as many opportunities to learn traditional skills. Conversely, many Inuvialuit youth have an interest in better understanding their traditional past. “*It is important [to me] to find out where I came from and what it was like long ago*” (Inuvialuk High School Student). Driven by these factors, the Inuvialuit Living History Project is seeking new ways to encourage Inuvialuit youth to engage more deeply with traditional Inuvialuit knowledge and skills such as hunting, fishing, tool making, sewing, hide preparation, and traditional Inuvialuktun language.

3.3 Using Google Earth as an educational tool

Google Earth is an accessible digital mapping technology that is freely available on the internet and has been widely used by youth for educational purposes in various contexts around the world. It uses satellite imagery to create an interactive digital representation of the globe that can be navigated, place-marked, measured and annotated by anyone through a computer or mobile device. Google Earth outreach promotes that teaching

relies in large part on the telling of stories about different cultures, as well as the exploration of different places, geographies, and natural environments around the world (Google Earth Education, n.d.). Using Google Earth maps and supplemental tools such as Tour Builder, it is possible to enable users to learn by virtually “visiting” different locations and interactively experiencing stories about people and activities in those places. A similar approach has been taken by the 5th Thule Atlas project (<https://thuleatlas.org/index.html?module=module.project>) which allows users to digitally re-trace the travel route taken by the Rasmussen expedition from Greenland to Siberia and to learn about Inuit culture from fieldnotes, recordings, historical photographs, and other digital representations of artifacts and traditional activities that have been incorporated into the Atlas. The Indigenous-Kamchatka Digital Atlas Project has utilized Google Earth mapping in Russian to engage local youth in the ongoing use of traditional language and in understanding the historical meaning of traditional place names (Thom et al., 2016).

Using Google Earth mapping, it is possible to capture highly individualized representations of traditional skills and activities in a geographically specific way. In this paper, I will first demonstrate how an interactive Google Earth map can help to facilitate the transfer of components of Inuvialuit traditional knowledge in ways that appeal to Inuvialuit youth and reflect important “watch” and “listen” aspects of Inuvialuit learning. I will then examine and highlight some key considerations and implications of using this strategy as a means of continuing to facilitate Inuvialuit learning in today’s digital age.

3.4 Research Methodology

In the summer and fall of 2018, I conducted fieldwork in the ISR, gathering input and direction from a cross-section of Elders, other traditional knowledge holders, and youth about how a Google Earth map could potentially contribute to the transfer of traditional knowledge in meaningful ways.

Drawing upon the experience of other ILH team members, my first step was to develop a prototype map using Google Earth (see Figure 2) that could be used to provide people

with a frame of reference for an interactive map and give them a sense of the range of possibilities that this platform could offer.

I incorporated a small sample set of archaeological and cultural heritage sites into the prototype. Within each site, I embedded different combinations of text, photograph, video, and other multi-media digital representations of artifacts and activities that were associated with those places. Figures 8 and 9 below provide examples of different levels of audio-visual engagement and interactivity.

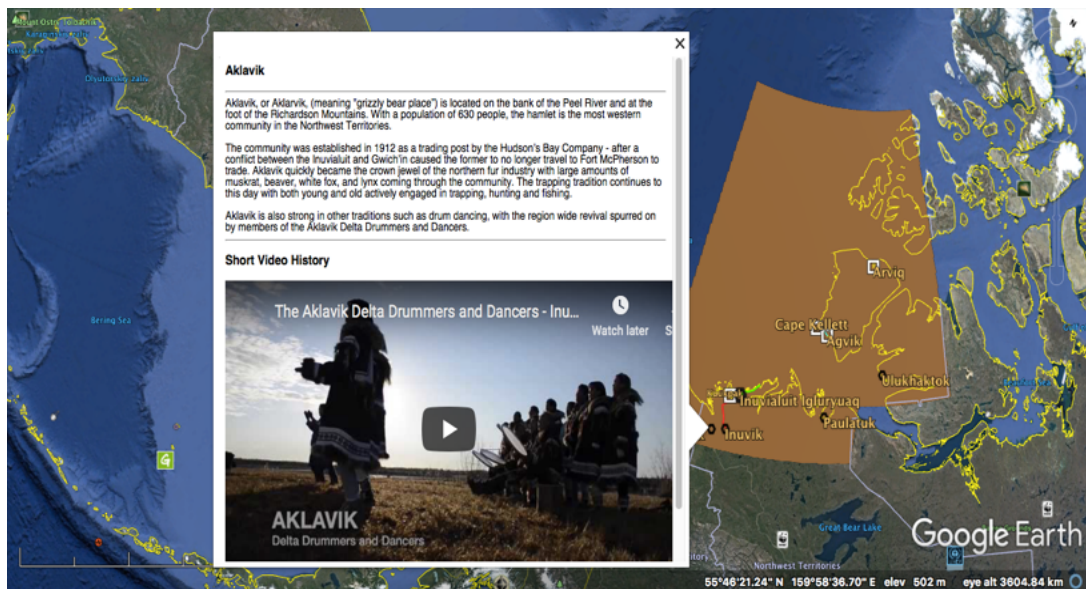


Figure 8: Sample site (Aklavik) with cultural heritage video

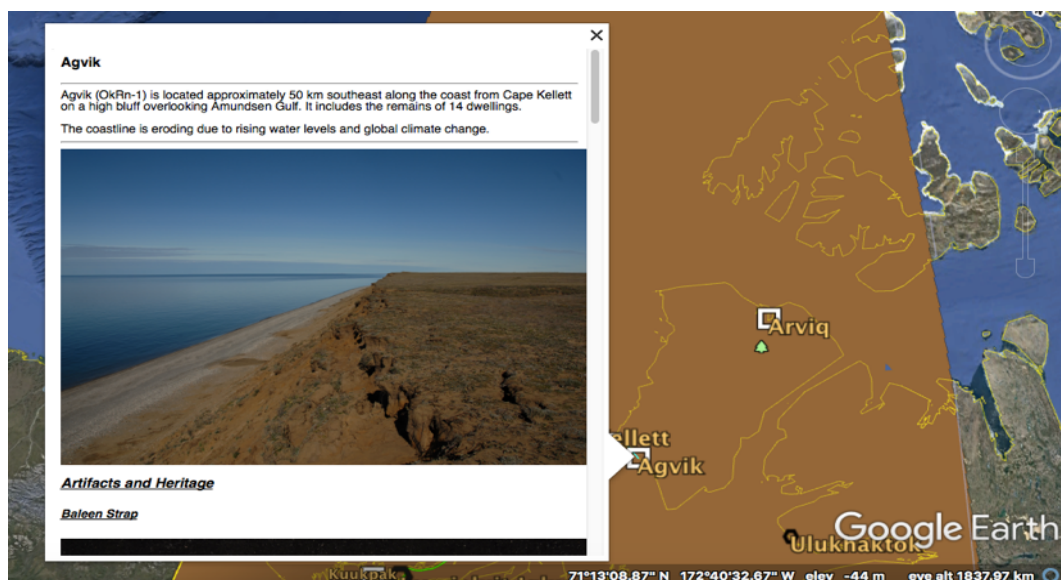


Figure 9: Sample archaeological site with photos and text descriptions

Next, I conducted the community consultation phase during two field trips to the ISR in the summer and fall of 2018, under an NWT Scientific Research License and a protocol approved by the University of Western Ontario's Non-medical Research Ethics Board. During these trips, I first had numerous informal discussions with Inuvialuit Elders, adults, and members of the general public about archaeology, cultural heritage, and digital mapping. These initial casual discussions were critical to my ability to build a level of rapport and trust within the community given that I was a non-Indigenous mature graduate student with no prior archaeological experience in the ISR. This allowed me to organize formal interviews in Inuvik and Tuktoyaktuk with eight Inuvialuit Elders and other traditional knowledge holders, to more specifically discuss the purpose, design, and content of the interactive map. Lastly, I was able to arrange a focus group discussion and two classroom workshops involving a total of thirty-seven High School students from Inuvik and Tuktoyaktuk to discuss what they found interesting about the map and how it could be used to learn about the Inuvialuit past (Appendix C).

3.5 Inuvialuit community engagement with the map

In order for the digital map to contribute to the intergenerational transfer of traditional knowledge, it must first have the capacity to appeal to different age groups and generations. Throughout the community consultation process, I found that Inuvialuit

community members connected easily with the map itself, while students and youth expressed additional interest in the underlying technology. For adults, the fascination with maps can be traced back to the strong relationship that the Inuvialuit have with a land-based lifestyle and the “mental” conceptions of traditional skills, knowledge, and other experiences. For youth, however, their initial interest seemed to be more technologically based. While most of the students that I talked with were already familiar with Google Earth and satellite imagery, many still characterized some features of the prototype such as the ability to “fly” from one place to another along a prescribed route and to measure the distance between two locations on the map as being “cool.”

Gilster (1997) defines digital literacy as the capacity to readily embrace and utilize information technology for specific needs and purposes. I found Inuvialuit students to be highly literate with technology. While most students preferred to use their cell phones, all were familiar with laptops and personal computers either in the schools or at home and all reported accessing the internet daily.



Figure 10: High school student workshop (Mangilaluk School, Tuktoyaktuk)

The digital map also triggered other noteworthy insights and reactions from the students. One student from East Three School asked probingly “*who is this map being built for?*”

while another student questioned whether there would be any “intellectual property” issues related to the information contained in the map. A third wondered whether the map could potentially “*be used out on the land to provide a narrated “walking tour” of archaeological sites?*” These are important reactions because they represent a deeper level of critical thinking about the creation and use of the map. The map can therefore serve not only as a means of captivating the interest of students in learning about traditional knowledge and skills, but also perhaps to stimulate their thinking about the significance and use of this information in the future.

3.6 Engaging Youth through technology

Another recurring theme throughout the consultation process with Elders and community members was the importance of sharing this information with Inuvialuit youth. One Inuvialuk Elder told me that “*We want our young people to know about their past*”, while Traditional Knowledge holder Lawrence Amos cautioned “*what are you going to do, take it to your grave ... your kids and younger people won't know.*” One of the challenges for the ILH project is to help the community to find new ways to engage Inuvialuit youth in learning about traditional ways of life.



Figure 11: Student engagement at East Three Secondary School, Inuvik

During the interactions with High School students in Inuvik and Tuktoyaktuk, the map proved to be very engaging (see Figures 10 and 11). During the Inuvialuit Living History Community Gathering at East Three Secondary School in Inuvik, students had the opportunity to talk with Elders, engage in traditional games and activities, and to interact with artifacts from heritage sites within the ISR. They also had an opportunity to experience a prototype of the interactive digital map. Many of these students were already familiar with Google Earth and were readily able to navigate to different places on the map. They also embraced the opportunity to add locations to the prototype map and became particularly animated as they instructed me on where to mark the precise location of their family's hunting and fishing camps on the map, and how to describe them. Others took over control of the keyboard and mouse and added their content with little assistance from me. During classroom workshops at the Mangilaluk school in Tuktoyaktuk, students described the digital map as *“cool, especially being able to add our own camps and see how far they are from Tuk.”* While it may have been the technology that initially drew their interest, it also became clear that these students understood the significance of capturing information about the past in the map. One student observed that she *“learned from my grandparents and watching drum dances and hearing stories from my parents, my aunties and my uncles”* and furthermore that the digital map enabled her *“to see where they hunted long ago and what it looked like.”* Another student noted that *“It is important to find out where I came from and what it was like long ago.”* These comments suggest that the map may also be connecting with the students on a deeper level that aligns with their perceptions of how Inuvialuit knowledge should be passed down from generation to generation.

3.7 Traditional teaching and learning with Google Earth

Traditional Inuvialuit pedagogy is based on listening, observation, and personal experience. An interactive Google Earth map can digitally represent traditional activities in a variety of visual and auditory ways, to mimic the first two elements. For example, photographs of traditional tools could be augmented with text and audio descriptions from Elders (in English and Inuvialuktun) of how those tools would have been used. This short video (<https://www.youtube.com/watch?v=d68etiC2B34&feature=youtu.be>)

produced by the Inuvialuit Communication Society, which features Elders Billy and Edward Reuben sharing their knowledge about moose hide tanning and traditional cloth making, illustrates what this could look like. Similar representations could be situated geographically on the map in the places that they may have occurred. Google Earth's interactive capabilities can also be used to relay stories. One way to accomplish this would be to capture personalized stories such as this video story (<https://www.youtube.com/watch?v=g2KauK1njin0>), produced by David Stewart of the Inuvialuit Communications Society, of Inuvialuk Elder Nellie Arey talking about her life history and travels on the land.

Our human experience and perception of our environment is shaped by how we move through it (Ingold, 2004), something that may be more difficult to capture in Google Earth. The experience of traversing the land by foot or by dog sled is different from seeing the land from the "birds' eye" view of a satellite image, which is the default in Google Earth. However, utilizing Google Earth's "flythrough" capabilities and incorporating 360° photospheres into placemarks on the map, it is possible to convey information not only in the correct geographic context but also from the perspective of being on the ground in that place. This view could be useful, for example, to depict how an ice flow should be "read" to ascertain the safest route forward. A Google Earth map could alternatively be set up to display narrated tours of particular traditional travel routes or to explain where, how, and why people harvest(ed) muskox on Banks Island. Using Google Earth's Tour Builder functionality, it is possible to document places along a traditional path with compositions of supporting photographs, text, or audio-visual descriptions of artifacts or activities that are associated with those places. When invoked by a map user, the map will then automatically traverse the prescribed route and display the supplemental audio-visual information at each place.

By incorporating these types of audio-video experiences into the map, Inuvialuit youth and interested others can watch, listen and start to learn about traditional activities through a personal computer or mobile device. These representations can also provide Inuvialuit youth in the present day with an appreciation of what traditional life on the land was like for their ancestors – thereby serving as an intermediary agent between the

past and the present. When used in these ways, the digital map can assist Elders in sharing their knowledge more broadly across the community, thereby enabling more people to access this information through the internet than might otherwise be feasible through face to face interactions, albeit with less control of the context and with whom this information is shared.

However, Inuvialuit traditional learning also requires direct hands-on experience in addition to listening and observation, which is something an interactive digital map cannot physically provide. There are ways that a Google Earth map can be configured to partially convey physical interaction with places and activities. In the example below, an interactive 3D model of the floor of a Thule sod house is linked to the placemark for a cultural site on Banks Island. A map user can click on the model and use their mouse to investigate the house floor from different angles and perspectives. By incorporating similar interactive models of places and activities into the map, learners could effectively “rehearse” being in a particular place or doing a particular activity as a precursor to actual physical experience.

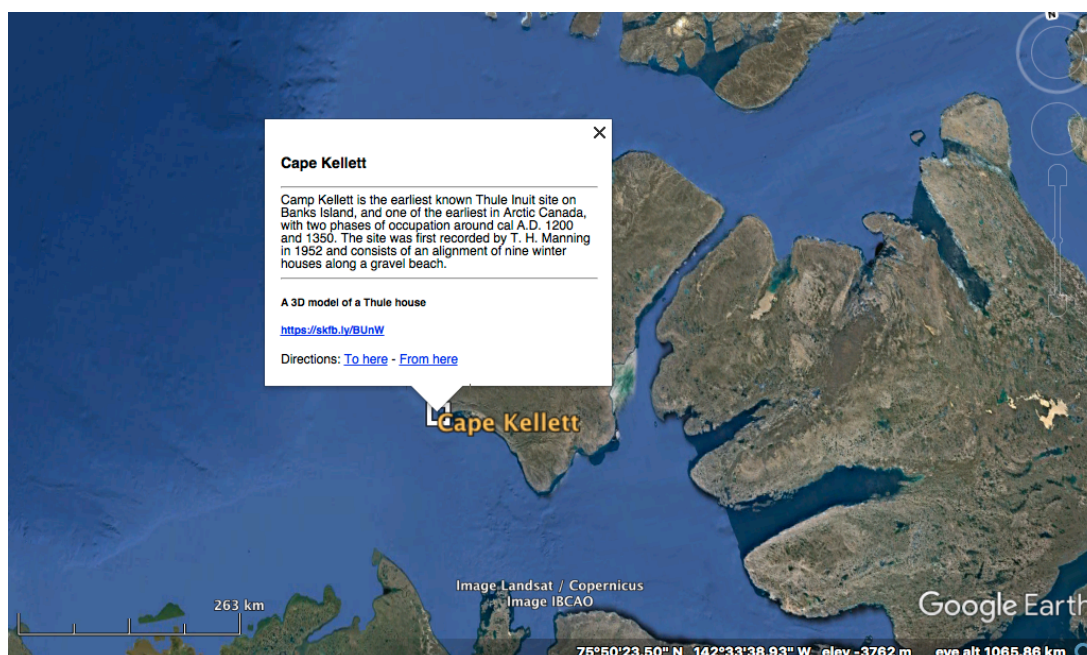


Figure 12: Interactive 3D model of a Sod House at Cape Kellett archaeological site

Alternatively, the map could be used in conjunction with other land-based traditional activity camps, workshops, games, or classroom activities as a pre-cursor to hands-on experience. For example, one high-school student suggested that the map could be transformed into a game where players could earn points by finding places and identifying traditional artifacts. This notion was further endorsed by several teachers who felt that such a gamification strategy could easily be incorporated into the learning curriculum for social science, history, or Inuvialuit traditional culture classes. Similarly, a 3D printed replica of a harpoon, such as this example (http://www.inuvialuitlivinghistory.ca/item_types/70) from the Macfarlane Collection, could be used in conjunction with the map in a classroom setting. By visiting a specific coastal location on the map, students would be able to listen to and observe photographs and video descriptions from Elders talking about how harpoons were used to hunt seals and beluga whales. The students could then physically interact with the 3D replica to acquire some sense of how the weapon would work.

3.8 Technical considerations and other usability factors

The effectiveness of an interactive map as a learning tool is influenced by differing perspectives on technology between adults and youth. I found the Elders that I spoke with to be generally aware of modern technological advances, but most seemed to be most comfortable with using basic photographs, audio files, and perhaps videos. Some Elders and adults approached the prototype map with trepidation because of their unfamiliarity with computers and satellite imagery. On the other hand, Inuvialuit students, who were more technology savvy, easily engaged with the map and preferred more sophisticated digital representations such as interactive photospheres, videos, 3D models, and drone flyovers. One adult community member expressed some concern that youth might be spending too much time on their phones or computers rather than out on the land learning through hands-on experience. However, the majority of Elders and adults that I spoke with positively endorsed the use of a computer-based map for sharing traditional knowledge because of the appeal of online technologies with youth.

Age demographics are another factor that will influence the map's reception. According to the 2016 NWT Census Statistics, 67% of individuals in the ISR are under 45 years old. Coincident with the rise of the internet and the proliferation of mobile phones and digital devices, Inuvialuit youth have grown up in a digital world that is increasingly defined by their access to the internet, mobile phones, and social media. The use of a digital mapping solution as a sharing and learning platform for traditional knowledge makes sense given the young population within the ISR, and the familiarity of this younger age bracket with digital technology.

3.8.1 Online learning implications

There are also other implications to be considered when digitally reflecting a learning process that was previously based exclusively on oral tradition and hands-on experience. One of the potential disadvantages of the map is that it could inadvertently convey information too generically across a large population of learners. Regional and other individual variations are an integral part of Inuvialuit Traditional knowledge. Some Elders such as Shirley Elias emphasized that TK is passed on within the particular context of the "*family circle*" and particular ways of doing things. While multiple stories and perspectives can easily be incorporated into the map (see Chapter 2), it would not be practical to tailor map content to individual users to maintain that "family circle."

Another factor to consider is that Google Earth preferences visual and auditory information over taste, smell, and touch, which cannot (yet) be easily digitized. There is no doubt that the experience of being physically present during beluga whale butchering on the shores of the Beaufort Sea would be different from a digital representation. Absent from the digital experience would be the smells of the sea and the whale, and the feeling of the wind in your hair. This is one of the potential pitfalls of communication in the digital age (Hertzog, 2001). In order to introduce smell, taste and touch into the map, it may be possible to include additional auditory or text based cues to describe the missing sensory elements, such as references to the salty air. Hertzog (2001) also points out another aspect of phenomenology that may affect perceptions of the map; while our human senses are biologically produced, they are also culturally influenced. It is

therefore possible for two individuals to see the same thing and have very different reactions. What one might find appetizing, the other might find unappealing.

Given these limitations, the map should not be conceived as a replacement for, or even an accurate representation of, physical experience. It can, however, serve as a useful tool for introducing aspects of Inuvialuit TK to youth and others who may have had limited or no exposure to these traditional experiences and learning opportunities.

3.8.2 Other mobile and internet technology considerations

Digital solutions such as Google Earth depend upon the internet and computer access. Although the Canadian Government and the CRTC have a strategy to increase and standardize high-speed broadband access to the internet for all Canadians, including those in remote and rural regions of the country, many Northern communities continue to have limited access to computer technology and high-speed internet (Dawson & Levy, 2016). There are notable differences in internet access capability between ISR communities. High-speed fiber optic cable internet connectivity is currently only available in Inuvik. High-speed access is expected to be extended to Tuktoyaktuk along the newly opened highway. However, Aklavik, Paulatuk, Uluhaktok, and Sachs Harbour continue to rely on slower dial-up and satellite internet. These differences in information communications technology (ICT) infrastructure correlate directly to the speed with which information can be accessed on the Internet. While there are several factors which can influence internet access speeds, fiber optic connections are incrementally faster than either dial-up or satellite-based alternatives. This means that an individual in Inuvik may be able to access a particular website in seconds, while someone in Sachs Harbour may require several minutes or longer to access the same website.

These internet bandwidth limitations also manifest themselves in different ways within the educational system in the ISR. The Beaufort Delta Educational Council has imposed restrictions on selected internet services, such as YouTube, as part of a policy initiative that is designed to ensure limited bandwidth resources are used appropriately by students for educational purposes. Such restrictions could impact the functionality of the map in the school environment because video content accessed through YouTube will not

display. Fortunately, the Principals and teachers that I worked with in both schools were very supportive of the educational potential of the interactive map and together have suggested technical workarounds that can be utilized. By working with the IT administrators in the school, it should be possible to implement specific technical permissions that would enable the map to access content from restricted sites such as YouTube under controlled academic circumstances. These permission rules would need to specify which sites are eligible to be accessed by the map, from which classrooms, and during which timeframes – and should be defined with input from the school administrators and teachers.

There are also notable differences in internet adoption within households in the ISR. According to the latest Northwest Territories census statistics, approximately 35% of households across the ISR do not have internet access (NWT Census Statistics, 2016). There are several factors that can influence internet usage. Cost prohibits some households from purchasing a computer and/or internet subscription, which represents a potential barrier to accessing the digital map. Many Inuvialuit, and in particular youth, might also prefer to access the internet from their mobile phones rather than from personal computers. All of the youth I met had cell phones, and accessed wifi at school, in public places (like libraries) and some of them also had access at home.

These differences in internet access preference and capability are important factors to consider because they directly impact the technical design and usability of the map. It may not be feasible to incorporate more sophisticated forms of digital content into the map because of their large file size and bandwidth requirements. Simple text and photographs require less bandwidth than video, 360 photospheres, and 3D models, which are based on larger digital file sizes. An interactive 3D model that loads in seconds in Inuvik could take hours in Sachs Harbour, thus rendering the map useless in one community but not another. If a desktop computer is required to display the map, then only those individuals with access to computers would be able to use it. A map that is populated primarily with low bandwidth photography and text might be less appealing to Inuvialuit youth, particularly if it becomes illegible when compressed to fit on a small mobile phone screen.

Ideally, the digital map should be equally accessible and usable to all members of the ISR regardless of where they live. In order to achieve this objective of equal access, some important trade-off decisions will be required in the design and deployment of the map. The initial deployment of the map should focus on integrating it within the ILH project website. The initial map design should therefore be geared toward larger computer screens rather than smaller cell phone screens. Map content should also initially focus on simple low bandwidth photographs, text, and videos to minimize the internet bandwidth requirements for the map to display. As the ICT infrastructure capabilities continue to evolve across the Arctic, additional and more sophisticated digital representations such as interactive 3D models can be incorporated into the map. It is also reasonable to expect that Google will continue to invest in ongoing improvements to mobile versions of the Google Earth software platform going forward.

3.9 Conclusions

An interactive digital map of Inuvialuit Cultural Heritage using Google Earth technology can be a useful and interesting way to engage Inuvialuit youth in learning about their history. By representing traditional places, skills, and activities through an interactive online interface, Inuvialuit youth and others who are interested in Inuvialuit culture can gain exposure to traditional skills and knowledge that might not otherwise be physically accessible to them. The visual and auditory properties of Google Earth can convey traditional information in a land-based way that aligns closely with Inuvialuit mental constructs and also adheres to Inuvialuit learning principles that emphasize listening and observation as precursors to direct experience. It will also allow community Elders and other knowledge holders to capitalize on the reach of the internet to convey their traditional knowledge more broadly than would be practical through individual face to face meetings.

In order to maximize the accessibility and usability of the map across all communities in the ISR in the near term, the initial deployment of the map will have to utilize lower bandwidth photographic, text, and video content. Because Inuvialuit learning also depends on direct hands-on experiences that are not easily replicated in Google Earth, the

map should ideally be deployed in conjunction with experiential learning tools, games, or activities. This approach would enable learners to listen to and observe traditional skills through the map, before performing those activities themselves through accompanying materials. In these ways, an interactive Google Earth map can support the Inuvialuit community in their pursuit of new, creative ways to share traditional knowledge intergenerationally within their community. The findings from this research may also be applicable in other Indigenous community contexts where there is a desire to integrate modern technologies with traditional approaches to learning and skill development.

3.10 References

- Atalay, S. (2006). Indigenous archaeology as decolonizing practice. *American Indian Quarterly*, 30(3/4), 280–310.
- Atalay, S. (2008). Multivocality and Indigenous Archaeologies Beyond Nationalist: Global Applicability of Indigenous Archaeologies. In M. J. M. Habu J., Fawcett C. (Ed.), *Evaluating Multiple Narratives*. Springer, New York, NY. 29-44.
- Berkes, F. (2009). *Indigenous Ways of Knowing and Climate Change*. Journal of the Royal Society of New Zealand 39(4): 151-156
- Bonesteel, S., Anderson, E., Public History Inc, & Canada. Indian and Northern Affairs Canada. (2006;2008). *Canada's relationship with Inuit: A history of policy and program development*. Ottawa: Indian and Northern Affairs Canada.
- Collignon, B., Weber Müller-Wille, L., & Canadian Circumpolar Institute. (2006). *Knowing places: The Inuinait, landscapes, and the environment*. Edmonton, AB: Canadian Circumpolar Institute (CCI) Press.
- Dawson, P., Levy, R., & Lyons, N. (2011). “Breaking the fourth wall”: 3D Virtual Worlds as tools for knowledge repatriation in Archaeology. *Journal of Social Archaeology*, 11(3), 387–402.
- Dawson, P., & Levy, R. (2016). From Science to Survival: Using Virtual Exhibits to Communicate the Significance of Polar Heritage Sites in the Canadian Arctic. *Open Archaeology*, 2, 209–231.
- Fifth Thule Expedition Atlas. (n.d.) Retrieved from: <https://thuleatlas.org/index.html?module=module.project> (accessed May 1, 2019).
- Friesen, J. W., & Friesen, V. A. L. (2005). *First nations in the twenty-first century: Contemporary educational frontiers*. Calgary: Detselig Enterprises.
- Gilster, P. (1997). *Digital literacy*. New York: Wiley Computer Pub.
- Google Earth Outreach, Education. (n.d.). Retrieved from: <https://www.google.com/earth/education/> (accessed May 1, 2019).
- Government of Canada. *Digital Canada 150*. Retrieved from: <https://www.ic.gc.ca/eic/site/028.nsf/eng/00591.html> (accessed May 1, 2019).

- Haukaas, C, & Hodgetts, L.M. (2016). The Untapped Potential of Low-Cost Photogrammetry in Community-Based Archaeology: A Case Study From Banks Island, Arctic Canada. *Journal of Community Archaeology & Heritage*, 3(1), 40–56.
- Herzfeld, M. (2001). Senses. *Anthropology: Theoretical Practice in Culture and Society*. 240-253.
- Ingold, T. (2004). Culture on the ground: The world perceived through the feet. *Journal of Material Culture*, 9(3), 315-340.
- Inuvialuit Regional Corporation. (n.d.). Retrieved from: <https://www.irc.inuvialuit.com/> (accessed May 1, 2019).
- Kelvin, L. (2016). There Is More Than One Way to Do Something Right: Applying Community-Based Approaches to an Archaeology of Banks Island, NWT. *Electronic Thesis and Dissertation Repository*. 4168.
<https://ir.lib.uwo.ca/etd/4168>
- Kitikmeot Heritage Society. (n.d.). Retrieved from: <https://www.kitikmeotheritage.ca/> (accessed May 1, 2019).
- Lyons, N., Dawson, P., Walls, M., Uluadluak, D., Angalik, L., Kalluak, M., ... Suluk, L. (2010). Person, place, memory, thing: How inuit Elders are informing archaeological practice in the Canadian north. *Canadian Journal of Archaeology*, 34(1), 1-31.
- Lyons, N. (2010). The Wisdom of Elders: Inuvialuit social memories of continuity and change in the 20th century. *Arctic Anthropology*, 47(1): 22-38.
- Lyons, N. (2013). Where the wind blows us: Practicing critical community archaeology in the Canadian north. Tucson: University of Arizona Press.
- Lyons, N., Schaepe, D. M., Hennessy, K., Blake, M., Pennier, C., Welch, J. R., ... Pennier, C. (2016). Sharing deep history as digital knowledge: An ontology of the Sq'ewlets website project. *Journal of Social Archaeology*, 16(3), 359–384.
- Ngata, W., Ngata-Gibson, H., & Salmond, A. (2012). Te Ataakura: Digital *Taonga* and Cultural Innovation. *Journal of Material Culture* 17(3), 229-244.
- NWT Bureau of Statistics. (2016). *Home Internet Access by Community (2009 to 2014)*. Retrieved from: https://www.statsnwt.ca/Housing/internet_usage.html (accessed May 1, 2019).
- NWT Bureau of Statistics. (2016). *Population by Age and Sex*. Retrieved from: <https://www.statsnwt.ca/census/2016/> (accessed May 1, 2019).

Stewart, A.M., Keith, D. and Scottie, J. (2004). Caribou Crossings and Cultural Meanings: Placing Traditional Knowledge and Archaeology in Context in an Inuit Landscape. *Journal of Archaeological Method and Theory*, 11(2): 183-211.

Taylor, D. R. F., & Lauriault, T. (2014). *Developments in the theory and practice of cybercartography: Applications and Indigenous mapping* (2nd ed.). Burlington: Elsevier Science.

Thom, B., Colombi, B. J., & Degai, T. (2016). Bringing Indigenous kamchatka to google earth: Collaborative digital mapping with the Itelmen peoples. *Sibirica*, 15(3), 1-30.

Chapter 4

4 Conclusions and recommendations

One objective of this research was to assess the potential, effectiveness, and implications of using a Google Earth-based interactive digital map to assist the Inuvialuit community in documenting and sharing their traditional knowledge and cultural heritage. This was accomplished by understanding why Inuvialuit perceive an interactive digital map to be an effective way to document and share their Traditional Knowledge, by documenting how Inuvialuit would like to see content in the map organized and managed, and by outlining the benefits and other implications of using a digital means to share this information within the Inuvialuit community as well as with others who may be interested.

Inuvialuit traditional knowledge (TK) is a continuously evolving and complex assembly of information about geography, the environment, hunting, fishing, subsistence activities, personal experiences, family histories, historical events, and legends. It is often directly associated with specific places and land-based activities and is passed down from one generation to another, primarily through oral tradition and storytelling. It is taught and learned through listening, observation, and direct hands-on experience. Inuvialuit TK is therefore vital for social cohesion and identity within the Inuvialuit community.

My research demonstrates that Google Earth can be configured to resemble the “mental maps” many Inuvialuit knowledge holders carry in their heads. This, along with its capacity to convey information about traditional activities in their proper geographic context is why a Google Earth map resonates so strongly with Inuvialuit. My research also shows that Google Earth maps can be configured using different arrangements of layers, colors, and placemarks to organize and display large amounts of TK information in ways that are meaningful to Inuvialuit. A broad cross-section of stories and personal experiences can be incorporated into an interactive Google Earth map that reflects the nuanced complexity and regional variation of Inuvialuit traditional customs and culture. Through these interactive stories and other digital representations of traditional places and activities, a Google Earth map can facilitate the sharing of Inuvialuit traditional

knowledge within their community as well as with other Canadians who may be interested in learning about their cultural heritage. Access to sensitive cultural information can be controlled through either the use of password controls or the development of a separate map specifically for use within the Inuvialuit community. Though it gives them less control over the context of knowledge sharing and with whom they share, community Elders and other knowledge holders can use Google Earth to convey their traditional knowledge more broadly than through individual face to face meetings. The use of technology can also provide an interesting way for Inuvialuit youth to start to learn about their archaeological history and cultural heritage through an online means that can facilitate listening and observation of traditional activities.

4.1 Inuvialuit Community integration

It will be critical for the Inuvialuit Living History (ILH) project to design and deploy the Google Earth map as a living entity where information content within the map can continue to grow and evolve, just as Inuvialuit TK continues to do so. This will require several supporting processes to be designed that will ideally engage and involve the Inuvialuit community in the ongoing production and support of the map. By using this approach, the implementation of the map can help to strengthen community identity through shared and collective efforts to build a living digital repository of their traditional knowledge and cultural heritage. The ongoing maintenance of the map will also involve lasting value-added relationships with Universities, Parks Canada, and other key heritage stakeholder groups such as the Prince of Wales Northern Heritage Centre. The primary value to the community of this initiative is not in the end product itself, but instead in these digital returns that result from the ongoing use and integration of the map within the community (Hennessy et al., 2013).

The incorporation of digital content related to this broad, multi-layered, complex, and evolving body of knowledge into a single digital map will be challenging. The information content within the map must be organized in a way that is accessible without being overwhelming, but that also reflects broadly on the regional and individual variations that exist within Inuvialuit culture. This will require several significant

decisions to be made by the ILH project and the Inuvialuit community at large. What types of sites and activities should and should not be incorporated into the map? What types of digital content can best represent those activities given the current ICT capacity in the ISR? How can map content best be organized for ease of user access? How often should new information be incorporated into the map?

4.2 Implementation recommendations

The following recommendations and guidelines may be useful to the Inuvialuit Living History project team to guide the development and incorporation of the interactive map into the Inuvialuit Living History website (<http://www.inuvialuitlivinghistory.ca/>)

1. The purpose and intended outcomes for the map should be clearly articulated and widely publicized within the Inuvialuit community. Based on the findings of my research, the primary purpose of the map will be to document and share Inuvialuit history and cultural heritage primarily within and for the Inuvialuit community. The map will serve as a living digital repository of Inuvialuit traditional knowledge that can be used to help to build and share that knowledge with future generations of Inuvialuit. However, the accessible nature of the internet and Google Earth technology will also create an opportunity for the map to serve a secondary purpose of enabling all Canadians and others who may wish to learn about Inuvialuit culture and heritage to do so.
2. In order to mitigate concerns about online access to sensitive cultural information, such as the location of gravesites, the ILH project will need to define a set of criteria and handling protocols that can be used to manage the display of sensitive content in the map. This work should ideally utilize TK labels for sensitive and sacred sites that have already been created for other Indigenous communities (<http://localcontexts.org/tk-labels/>). Information about sensitive or sacred sites should not be displayed on the version of the map that will be accessible from the main ILH website. However, information about these sensitive locations can still be documented on a version of the Google Earth map that is maintained for internal and community use by the Inuvialuit Cultural

Resource Centre. This version of the map could be made accessible from a designated computer within the ICRC. In this way, the ICRC could ensure that only members of the Inuvialuit community or others with specific approval to do so could access the special information on this map.

3. In order to minimize technical and logistical complexity, the following technical design principles can be used by the ILH project to guide the construction of the public version of the Google Earth map will be incorporated into the ILH website. Map content design should be based initially on the larger screen size of a computer or laptop rather than a mobile phone or iPad. While mobile versions of the Google Earth software platform are expected to continue to improve over time, I found it difficult during the prototype development to effectively display certain types of map content on the smaller screen sizes. The digital content used to represent places in the map should be based initially on simple file formats such as photographs, text, and short audio-video clips. The smaller file sizes associated with these types of content will help to minimize the internet bandwidth requirements for the map, allowing its use throughout the ISR, even in communities reliant on dial-up or satellite internet access. Keeping digital content files small will reduce the size of the internal .kmz file that Google Earth uses to store its map content configurations, thereby making it possible to create a standalone version of the map that draws content only from the local .kmz file and does not require the internet to function. This standalone version of the map could be used in a variety of household, community, or classroom contexts where lack of internet access is a concern. Using Google Streetview and Google Photos, it may also be possible to incorporate user-generated 360° photos of local places into the map, because of ongoing enhancements to these tools by Google. Access to other complex files such as videos and 3D models should be done through embedded KML links to common external internet sources such as YouTube and Sketchfab. Using this approach will minimize the internet bandwidth requirements for the map to display correctly, which will help to ensure a more consistent user experience in accessing the map from any of the communities in the ISR. As the ICT infrastructure capabilities continue to evolve across the

Arctic, it may become possible to add additional and more sophisticated digital representations to the map over time.

4. The ILH project should also investigate complementary methods of deploying the map in conjunction with other direct experiential learning tools, games, workshops or land-based camps because Inuvialuit learning also depends on direct hands-on experience. By working in collaboration with the Beaufort Delta Education Council, the map could be integrated into the new course materials and methods that could be incorporated into the teaching curriculum for Inuvialuit history and culture. Alternatively, the ICRC could work with the community to sponsor land-based activity camps for youth and others during the summer months to gain hands-on experience with traditional activities that are first introduced to participants by the map.
5. The ILH project should compile an inventory of sources of pre-existing digital information that can be readily incorporated into the map. These information sources should be reused wherever possible to avoid the ongoing proliferation of multiple disparate databases and archives. Several such information sources already exist, including the Reciprocal Research Network and the Northwest Territories Archives (<https://www.pwnhc.ca/nwt-archives/>.) The RRN contains some digital information which is already integrated with the ILH website. The Inuvialuit Communications Society has published a comprehensive library of videos on YouTube, containing information about traditional activities, places, and stories, told in both English and Inuvialuktun. There are also comprehensive sources of traditional place name information in the Inuvialuit Traditional Place Name Virtual Exhibit (<https://www.pwnhc.ca/item/inuvialuit-place-name-virtual-exhibit/>). The ILH project should also exploit synergies with other emerging and ongoing research projects such as the Inuvialuit Place Names project (<https://www.irc.inuvialuit.com/research-glance>). Lastly, the ICRC has a digital archive of audio files from past interviews with Elders that could serve as a potential source of language content for the map. However, many of these

recordings are quite lengthy and therefore would require analysis and considerable editing to be suitable for incorporation into the map.

6. The ILH project should define a process for members of the Inuvialuit community to be able to suggest what digital content they would like to see incorporated into the map. Facebook is a very popular and highly used social media platform across the ISR. The ILH project should consider utilizing a designated Facebook page for the collection of community created stories, photographs, and videos. The creation and promotion of this input channel would help the ILH project to build a greater sense of community participation and involvement in the development of the map as a living repository of their cultural heritage.
7. Lastly, the ILH project will need to document a set of technical and administrative processes for the ongoing post-implementation support of the map. Following the creation and deployment of the initial version of the map in the ILH website, a master version of the map should be stored on a computer in the ICRC or another centrally accessible location. This computer will require internet access and Google Earth Pro software. A copy of this master map can be created and integrated with the ILH website using browser-based Google Earth plugin tools. A schedule for future digital content updates should be pre-defined, to facilitate planning for these updates. A set of technical procedures to manage software upgrades should also be documented including regression testing steps to ensure that any static digital content stored in the map continues to function as expected. It would also be advantageous to develop local technical expertise using online Google Earth training resources (<https://www.google.com/earth/outreach/learn/>) as part of an ICRC sponsored high school co-op or internship learning opportunity in support of the map. The original rationale to use Google Earth should also be included for future reference by the Inuvialuit community. While Google Earth is free, already familiar to many in the ISR, and well supported by a wealth of online training resources, it is only one software solution option in a product market of GIS and

mapping solutions that will continue to expand and evolve over time. By documenting the original considerations weighed in selecting Google Earth, the Inuvialuit community will have the potential to revisit the marketplace and consider other options at their discretion.

The implementation of these recommendations by the ILH project team would assist the Inuvialuit community in their pursuit of new digital ways of documenting and sharing their traditional knowledge.

4.3 Potential beyond the Inuvialuit Settlement Region

My research project has contributed a localized Inuvialuit example to anthropological scholarship on community-based approaches to digital archaeology, which can help to further change and decolonialize traditional archaeological research in settler contexts like Canada (Atalay, 2006; Basu, 2011; Boast, 2011; Christen, 2006; Dawson et al, 2011; Lyons et al, 2016). While this map will be constructed with and predominantly for Inuvialuit, it can also enable other interested Canadians to learn about Inuvialuit cultural heritage. My key findings link digital mapping and modern technology with traditional Indigenous values in a culturally meaningful way that may also be applicable in other Indigenous archaeology contexts around the world.

4.4 References

- Atalay, S. (2006). Indigenous archaeology as decolonizing practice. *American Indian Quarterly*, 30(3/4), 280–310.
- Basu, P. (2011). Object diasporas, resourcing communities: Sierra Leonean collections in the global museumscape. *Museum Anthropology*, 34(1):28-42
- Boast, R. (2011). Neocolonial Collaboration: Museum as Contact Zone Revisited. *Museum Anthropology*, 34(1):56-70.
- Christen, K. (2006). Ara Irititja: Protecting the Past, Accessing the Future—Indigenous Memories in a Digital Age. *Museum Anthropology*, 29 (1):56–60
- Dawson, P., Levy, R., Lyons, N. (2011). ‘Breaking the fourth wall’: 3D virtual worlds as tools for knowledge repatriation in archaeology. *Journal of Social Archaeology*, 11(3), 387-402.
- Hennessy, K., Lyons, N., Joe, M., Loring, J., & Arnold, C. (2013). The Inuvialuit Living History Project: Digital Return as the Forging of Relationships between Institutions, People, and Data. *Museum Anthropology Review*, 7(1-2): 44-73.
- Lyons, N., Hodgetts, L., & Friesen, T.M. (2016). Contemporary Modes of Knowledge Production & Curation in Western Arctic Archaeology. Canadian Archaeological Association annual meeting, Whitehorse

Appendices

Appendix A: University Research Ethics Approval



Western
Research

Date: 5 June 2018

To: Lisa Hodgetts

Project ID: 111324

Study Title: Interactive digital mapping of Inuvialuit archaeology and heritage

Application Type: NMREB Initial Application

Review Type: Full Board

Meeting Date: 04/May/2018 12:30

Date Approval Issued: 05/Jun/2018 10:19

REB Approval Expiry Date: 05/Jun/2019

Dear Lisa Hodgetts

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the WREM application form for the above mentioned study, as of the date noted above. NMREB approval for this study remains valid until the expiry date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date	Document Version
ethics poster (v1.1)	Recruitment Materials	14/May/2018	1.1
In Person Recruitment script (v1.1)	Oral Script	14/May/2018	1.1
JG focus group topics(v1.0)	Focus Group(s) Guide	21/Mar/2018	1.0
JG interview guide(v1.0)	Interview Guide	21/Mar/2018	1.0
LOI_DIAH_Focus Groups(v1.2)	Written Consent/Assent	01/Jun/2018	1.2
LOI_DIAH_Interviews(v1.2)	Written Consent/Assent	01/Jun/2018	1.2
Photographic-Release DIAH (v1.1)	Written Consent/Assent	14/May/2018	1.1
Prototype Sample (May 14, 2018) - J Grieve	Other Data Collection Instruments	14/May/2018	1.0

No deviations from, or changes to the protocol should be initiated without prior written approval from the NMREB, except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario. Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB. The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000941.

Please do not hesitate to contact us if you have any questions.




Sincerely,

Katelyn Harris, Research Ethics Officer on behalf of Dr. Randal Graham, NMREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix B: Northern Scientific Research License Approval



<p>2018</p> <p>Northwest Territories Scientific Research Licence</p>		<p>Licence No. 16332 File No. 12 410 849 June 13, 2018</p>
Issued by:	Aurora Research Institute – Aurora College Inuvik, Northwest Territories	
Issued to:	Dr. Lisa Hodgells Western University Anthropology Department 	
Affiliation:	Western University	
Funding:	Social Sciences & Humanities Research Council (SSHRC) Ontario Graduate Scholarship (OGS)	
Team Members:	Jeff Grieve	
Title:	Digital Mapping of Inuvialuit Archaeology & Heritage	
Objectives:	To solicit input from the Inuvialuit community on how best to structure the interactive digital map to create meaningful virtual representations of archaeological sites and associated heritage information.	
Dates of data collection:	June 15, 2018 to September 24, 2018	
Location:	Inuvik, Tuktoyaktuk	
<p>Licence No. 16332 expires on December 31, 2018 Issued in the Town of Inuvik on June 13, 2018</p> <p></p> <p>Vice President, Research Aurora Research Institute</p>		
		

Inuvik Hunters and Trappers Committee
Town of Inuvik
Tuktoyaktuk Community Corporation
Tuktoyaktuk Hunters and Trappers Committee

Appendix C: Community engagement

Date	Activity type	Location	Participants
July 15-21, 2018	Informal discussions	Great Northern Arts Festival, Inuvik	Inuvialuit Community members and other general public visitors
July 24, 2018	Semi-structured Interviews	Inuvik	Albert Elias, Shirley Elias
July 24, 2018	Semi-structured Interviews	Inuvik	Beverly Amos, Lawrence Amos
July 24, 2018	Community meeting	Inuvik	Community Elders and ILH Project team members
July 25, 2018	Semi-structured Interviews	Tuktoyaktuk	Darryl Nasogaluak, Josephine Nasogaluak
July 25, 2018	Informal discussions	Tuktoyaktuk	Community Elders
July 27, 2018	Informal discussions	Inuvik	Inuvialuit Cultural Centre staff
September 25-28, 2018	Informal discussions	Community Gathering, ILH project Inuvik	Students (Grades 7-12, staff, Elders at East Three Secondary School

September 28, 2018	Semi-structured Interviews	Inuvik	James Pokiak
September 28, 2018	Semi-structured Interviews	Inuvik	Mervin Joe
October 1, 2018	Student Focus Group	East Three School, Inuvik	Grade 10-12 Students (4 participants)
October 3, 2018	Classroom workshops	Mangilaluk School, Tuktoyaktuk	Grade 10-12 Students <ul style="list-style-type: none"> • Environmental Stewardship class (23 participants) • Agriculture class (10 participants)

Appendix D: Visual Tour of Prototype

A brief visual tour can be viewed here: <https://youtu.be/9n3TBLcsOzE>

Curriculum Vitae

Name:	Jeffrey Grieve
Post-secondary Education and Degrees:	<p>University of Western Ontario London, Ontario, Canada 2017-2019 M.A. (Archeology)</p> <p>The University of Western Ontario London, Ontario, Canada 2011-2016 B.A. (Anthropology)</p> <p>Ivey Business School London, Ontario, Canada 2014 Ivey Executive Development Program (Certificate)</p> <p>University of Manitoba Winnipeg, Manitoba, Canada 2008 CHERD, University Management Program (Certificate)</p> <p>The University of Western Ontario London, Ontario, Canada 1981-1985 B.Sc. (Computer Science & Mathematics)</p>
Honors and Awards:	<p>W. Garfield Weston Award in Northern Archaeological Research 2018-2019 (Masters)</p> <p>Social Science and Humanities Research Council (SSHRC) Canadian Graduate Student (Masters) 2018-2019</p> <p>Dean's Honors List, Faculty of Social Science, Western University 2016</p> <p>Dean's Honors List, Faculty of Science, Western University 1985</p> <p>Entrance Scholarship, Western University 1981</p>
Related Work Experience:	<p>Teaching Assistant The University of Western Ontario 2017-2019</p>

Presentations:

Canadian Archaeological Association

Digital Mapping of Inuvialuit Traditional knowledge using Google Earth

Quebec City, Quebec.

2019

Indigenous Mapping Workshop

Digital Mapping of Inuvialuit Archaeology and Cultural Heritage

Montreal, Quebec.

2018

Western Anthropology Graduate Student Conference

Digital Mapping in the Inuvialuit Settlement Region

London, Ontario.

2018